



INTERNATIONAL CONFERENCE GUIDEBOOK

#3rd

ISRITI 2020

Yogyakarta - Indonesia
10 December 2020

**ARTIFICIAL INTELLIGENCE
for SOCIAL INTERACTIONS**

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STMIK AKAKOM
YOGYAKARTA



IEEE
INDONESIA SECTION

International Seminar on Research of Information Technology and Intelligent Systems

The 3rd ISRITI 2020

10 December 2020

STMIK AKAKOM YOGYAKARTA

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WELCOME SPEECH FROM THE GENERAL CHAIR OF THE 3rd ISRITI 2020

Dear colleagues and friends.

On behalf of the organizing committee, I am delighted to welcome all participants to the 3rd International Seminar on Research of Information Technology and Intelligent Systems (ISRITI 2020). This conference is the third international conference held by STMIK Akakom Yogyakarta, Indonesia and the first to be held by STMIK Akakom in virtual form on December 10th, 2020.

In this conference, the committee decided to choose the following theme: “Artificial Intelligence for Social Interactions”. This highlight was chosen because various advances in the field of AI have recently raised concerns that AI will replace various things that are the human domain. For us, AI can be used to better understand social interactions and to build machines that work more collaboratively and effectively with humans. Therefore, by highlighting that theme in ISRITI 2020, we hope we can raise awareness towards AI for social interactions.

The aim of the conference is to provide an interactive international forum for sharing and exchanging information on the latest research in the area of information technology, computer sciences, informatics, and related fields. Nearly 135 academicians, researchers, practitioners, and presenters from 17 countries (Indonesia, Malaysia, India, USA, Brazil, Australia, South Korea, Hungary, Morocco, Vietnam, Iraq, China, Thailand, Turkey, Ireland, Romania, Russia, and Saudi Arabia) gathered in this event. In total, there are 262 active papers submitted to this conference. Each paper has been reviewed with tight criteria from our invited reviewers. Based on the review result, 135 papers have been accepted, which lead to an acceptance rate of 51.5%. This conference will not be successful without extensive effort from many parties. First, I would like to thank all keynote speakers for allocating their valuable time to share their knowledge with us. I would also like to express my sincere gratitude to all participants who participate in this conference. Special acknowledgement should go to the Technical Program Committee Chairs, Members, and Reviewers for their thorough and timely reviewing of the papers. We would also like to thank our sponsors: IEEE Indonesia Section and Research and Society Service Institution at STMIK Akakom. Last but not least, recognition should also go to the Local Organizing Committee members who have put enormous effort and support for this conference. At last, we hope that you have an enjoyable and inspiring moment during our conference. Thank you for your participation in ISRITI 2020.

Yogyakarta, 10 December 2020
General Chair of the 3rd ISRITI 2020

Dr. Bambang Purnomosidi D. P.

WELCOME SPEECH FROM THE CHAIRMAN OF STMIK AKAKOM YOGYAKARTA

The honourable
Keynote Speakers (Dr. Zoohan Gani from Victoria University and Assc. Prof. Ahmad Hoirul Basory from King Abdul Azis University)
Chairman of Widya Bakti Foundation and his staffs,
Representatives from IEEE Indonesia Chapter and Central IEEE,
Team of Indonesia Researcher and Scientist Institute,
Researchers and conference attendees,
Ladies and Gentlemen,

Assalamu'alaikum Wr. Wb.

May peace and health be upon us all.

First of all, let us express our utmost gratitude to God Almighty (SWT) for His blessings and grace so that even though in this coronavirus pandemic atmosphere, we can all still participate in the third iSriti international conference. On this occasion, let me express my sincere appreciation to the Keynote Speakers: Dr. Zoohan Gani from Victoria University, Sydney Australia, and Assoc. Prof. Dr. Ahmad Hoirul Basory from King Abdul Azis University, Rabig, Makkah, Saudi Arabia for their willingness to share their brilliant ideas and insights to be presented at this conference.

Dear ladies and gentlemen

On this occasion, as the head of STMIK AKAKOM Yogyakarta, I am saddened to state that the third iSriti conference had to be held online, considering that the coronavirus pandemic has not ended. Even though a pandemic currently hits us, the researchers' enthusiasm is apparent in the number of research articles submitted. We received up to 262 articles from 17 countries. Around 135 articles were accepted to be readily presented online in a conference forum with the theme: Artificial Intelligence for Social Interactions.

As the organizers of iSriti, we are very proud and grateful for the researchers' participation who have been willing to submit their research results to be published in this conference forum. We would also like to thank IEEE and IRSI, who have trusted and supported this conference from the very beginning. We still hope to build networks and information exchange between academics, practitioners, researchers, and the government to identify and explore issues, opportunities, and solutions to face challenges in the current era of technological disruption.

Finally, on this occasion, I would like to express my utmost gratitude to:

- 1) The distinguished keynote speakers who have been willing to share their valuable knowledge in this conference;
 - 2) The third iSriti researchers who have presented and will present their research results;
 - 3) Reviewers who have carefully reviewed the articles of the researchers;
 - 4) Moderators who are more than willing to lead the plenary session;
 - 5) IEEE for trusting us to hold this international conference;
 - 6) IRSI, which has supported the third iSriti activities until now;
 - 7) The committee that has been working hard to prepare this international conference according to plan;
- Last but not least, as the organizer, I would like to sincerely apologize for any shortcomings or inconveniences during this event.

Thank you very much for your kind attention, and *Wassalamu'alaikum Wr. Wb.*

Yogyakarta, 10 December 2020

The Chairman of STMIK AKAKOM Yogyakarta

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PLENARY SPEAKERS

The 1st Plenary Speaker



Dr. Zoohan Gani

**Victoria University, Sydney
Australia**

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*PhD Information Systems 2004 – 2009
University of Southern Queensland, Australia*

*Master in Business Information Systems 1996 – 1997
Griffith University, Australia*

*Undergraduate Diploma in Business Information Processing 1994 – 1995
City University, London, United Kingdom*

The 2nd Plenary Speaker:



Assoc. Prof. Dr. Ahmad Hoirul Basori

**King Abdulaziz University, Saudi Arabia
Associate Professor, Artificial Intelligence Lab., FCITR-
abasori@kau.edu.sa**

He received B.Sc (Software Engineering) degree from Institut Teknologi Sepuluh Nopember Surabaya in 2004 and the Ph.D (Computer Graphics) from Universiti Teknologi Malaysia, Johor Bahru, Johor, in 2011. In the same year, he has been appointed as Assistant Professor with the Department of Computer Graphics and Multimedia, Universiti Teknologi Malaysia. From 2013-2016, he has worked as an Assistant Professor in Faculty of Computing and Information Technology Rabigh, King Abdulaziz University. In 2016, he was promoted to Associate Professor rank in Faculty of Computing and Information Technology Rabigh, King Abdulaziz University.

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Ekaniza, Raki	1A.5	21	<i>PSO-Learned Artificial Neural Networks for Activity Recognition</i>
Eko Sulisty, Meiyanto	2C.6	428	<i>Design and Development of Bit Error Measurement using FPGA for Visible Light Communication</i>
El Khalyly, Badr	3A.4	638	<i>A Kubernetes Algorithm for scaling Virtual Objects</i>
Elsa, Corry	2G.1	577	<i>Case Study: AppDynamics Application as Business Intelligence to Support Digital Business Operations at PT PGD</i>
Emanuel, Andi Wahyu Rahardjo	1C.3	100	<i>Influence Distribution Training Data on Performance Supervised Machine Learning Algorithms</i>
Engel, Ventje	1E.6	203	<i>Network Attack Detection System Using Filter-based Feature Selection and SVM</i>
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Fachrie, Muhammad	2G.1	583	<i>Guided Genetic Algorithm to Solve University Course Timetabling with Dynamic Time Slot</i>
Fadhilah, Amanda	1D.8	170	<i>Measurement of Information Security Awareness Level: A Case Study of Online Transportation Users</i>
Fahmi, Fahmi	2B.4	371	<i>Development of The Personnel Monitoring System Using Mobile Application and Real-Time Database During the COVID19 Pandemic</i>
Fahrudin, Tresna	2A.7	344	<i>Indonesian Stock Price Prediction including Covid19 Era Using Decision Tree Regression</i>
Fanani, M.	1C.7	117	<i>Implementation of Maximum Power Point Tracking on PV System using Artificial Bee Colony Algorithm</i>
Faraby, Muhira	2C.4	418	<i>The Single Tuned Filter Planning to Mitigate Harmonic Pollution in Radial Distribution Network Using Particle Swarm Optimization</i>
Fardan, Fardan	1D.3	140	<i>Experimental Security Analysis for Fake eNodeB Attack on LTE Network</i>
Farrell, Mochammad	2E.3	505	<i>Combined Firefly Algorithm-Random Forest to Classify Autistic Spectrum Disorders</i>
Fatichah, Chastine	3C.2	661	<i>The Use of Pre and Post Processing to Enhance Mandible Segmentation using Active Contours on Dental Panoramic Radiography Images</i>
Ferdiansyah, Indra	1C.7	117	<i>Implementation of Maximum Power Point Tracking on PV System using Artificial Bee Colony Algorithm</i>

	2C.3	412	<i>Design and Implementation of SVPWM Inverter to Reduce Total Harmonic Distortion (THD) on Three Phase Induction Motor Speed Regulation Using Constant V/F</i>
	2C.2	406	<i>Three Phase Induction Motor Dynamic Speed Regulation Using IP Controller</i>
Firdaus, Diash	1D.7	164	<i>DDoS Attack Detection in Software Defined Network using Ensemble K-means++ and Random Forest</i>
Firdaus, Diaz	2D.6	476	<i>Topic-Based Tweet Clustering for Public Figures Using Ant Clustering</i>
Fitria, Irma	1G.8	306	<i>Ship Heading Control Using Nonlinear Model Predictive Control</i>
Fitriati, Andi	2C.4	418	<i>The Single Tuned Filter Planning to Mitigate Harmonic Pollution in Radial Distribution Network Using Particle Swarm Optimization</i>
Frannita, Eka	2E.2	499	<i>Supervised Deep Learning for Thyroid Nodules Classification Based on Margin Characteristic</i>
G A B C D E F G H I J K L M N O P Q R S T U W X Y Z			
Ginting, Ishak	1D.3	140	<i>Experimental Security Analysis for Fake eNodeB Attack on LTE Network</i>
Gitakarma, Made Santo	1F.1	221	<i>Designing Wireless Sensor Network Routing on Agriculture Area Using The LEACH Protocol</i>
Gumilar, Langlang	3E.2	711	<i>Variations in the Placement of DFIG in the Power System to Changes of Short Circuit Current</i>
Gunawan, Dadang	1E.2	182	<i>Initial Access in 5G mmWave Communication using Hybrid Genetic Algorithm and Particle Swarm Optimization</i>
Gupta, Anju	2C.9	445	<i>Robust Control Design Procedure and Simulation of PRES Controller having Phase-Locked Loop(PLL) control technique in Grid-Tied Converter</i>
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Halim, Arwin	2A.4	326	<i>Optimization of SV-kNNC using Silhouette Coefficient and LMKNN for Stock Price Prediction</i>
Hamed, Fatima	1B.7	68	<i>Risk Prediction of Major Depressive Disorder using Artificial Neural Network</i>

Hamka Ibrahim, Muhammad	2C.6	428	<i>Design and Development of Bit Error Measurement using FPGA for Visible Light Communication</i>
Hanifa, Annisa	2C.6	428	<i>Design and Development of Bit Error Measurement using FPGA for Visible Light Communication</i>
Harintaka, Harintaka	2G.5	604	<i>Comparison of the Latest DTM with DEM Pleiades in Monitoring the Dynamic Peatland</i>
Hartanto, Rudy	2B.1	354	<i>The User Experience effect of Applying Floating Action Button (FAB) into Augmented Reality Anatomy Cranium Media Learning Prototype</i>
	2G.3	593	<i>Multi-Point Travel Destination Recommendation System In Yogyakarta Using Hybrid Location Based Service-Floyd Warshall Method</i>
Hasibuan, Siti	1B.3	52	<i>Speaker Recognition Using Mel Frequency Cepstral Coefficient and Self-Organising Fuzzy Logic</i>
Hasim, Sitronella	1F.8	262	<i>Performance Evaluation of Cell-Edge Femtocell Densely Deployed in OFDMA-Based Macrocellular Network</i>
Hastuti, Puji	2G.4	599	<i>Application For Detection Of Pedestrian Position On Zebra Cross</i>
Hermawan, Tofan	1F.3	233	<i>Android Forensic Tools Analysis for Unsend Chat on Social Media</i>
Hermawati, Hermawati	3A.1	621	<i>Facial Expression Recognition and Face Recognition Using a Convolutional Neural Network</i>
Herumurti, Darlis	3C.2	661	<i>The Use of Pre and Post Processing to Enhance Mandible Segmentation using Active Contours on Dental Panoramic Radiography Images</i>
Hery, Hery	1C.1	89	<i>Website Design for Locating Tuna Fishing Spot Using Naïve Bayes and SVM Based on VMS Data on Indonesian Sea</i>
Hidayat, Firhat	1E.6	203	<i>Network Attack Detection System Using Filter-based Feature Selection and SVM</i>
Hidayat, Risanuri	3B.1	642	<i>Comparison of Feature Extraction for Speaker Identification System</i>
	1F.5	245	<i>Single Snapshot-Spatial Compressive Beamforming for Azimuth Estimation and Backscatter Reconstruction</i>
	1B.3	52	<i>Speaker Recognition Using Mel Frequency Cepstral Coefficient and Self-Organising Fuzzy Logic</i>
Hidayat, Taufik	2G.7	615	<i>Validation of Information Technology Value Model for Petroleum Industry</i>

	2G.6	609	<i>Model Development of Information Technology Value for Downstream Petroleum Industry</i>
	2F.1	534	<i>Effect of Android and Social Media User Growth on the Financial Technology Lending Borrowers and its Financing</i>
Hikmah, Awaliyatul	1C.2	94	<i>The Best Parameter Tuning on RNN Layers for Indonesian Text Classification</i>
Hikmarika, Hera	3A.1	621	<i>Facial Expression Recognition and Face Recognition Using a Convolutional Neural Network</i>
Hikmaturokhman, Alfin	1G.3	278	<i>5G New Radio (NR) Network Planning at Frequency 2,6 GHz in The Gold Triangle Area of Jakarta</i>
	1G.2	272	<i>Techno-Economic 5G New Radio Planning at 26 GHz Frequency in Pulogadung Industrial Area</i>
Hilmizen, Naufal	1A.6	26	<i>The Multimodal Transfer Learning for Diagnosing COVID-19 Pneumonia from Chest CT-Scan and X-Ray Images</i>
Hindrayani, Kartika	2A.7	344	<i>Indonesian Stock Price Prediction including Covid19 Era Using Decision Tree Regression</i>
Husin, Zaenal	3A.1	621	<i>Facial Expression Recognition and Face Recognition Using a Convolutional Neural Network</i>
Hutami, Augustine	2E.2	499	<i>Supervised Deep Learning for Thyroid Nodules Classification Based on Margin Characteristic</i>
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Iftadi, Irwan	2C.6	428	<i>Design and Development of Bit Error Measurement using FPGA for Visible Light Communication</i>
Indriawati, Katherin	1G.6	295	<i>Particle Filter Based Speed Estimator for Speed Sensorless Control in Induction Motor</i>
	1G.7	301	<i>Disturbance Observer-Based Speed Estimator for Controlling Speed Sensorless Induction Motor</i>
Irawan, Arif	2B.8	394	<i>Smart Safe Prototype Based Internet of Things (IoT) with Face and Fingerprint Recognition</i>
Irnanan, Roni	2C.1	400	<i>Minimization of Power Losses through Optimal Placement and Sizing from Solar Power and Battery Energy Storage System in Distribution System</i>
Iskandar, Nur Muhamad	1G.1	267	<i>A Combination of Defected Ground Structure and Line Resonator for Mutual Coupling Reduction</i>
Isnandar, Suroso	2C.5	423	<i>Analysis of Performance Index in Transmission Expansion Planning of Sulawesi's Electricity System</i>

Istikmal, Istikmal	1D.3	140	<i>Experimental Security Analysis for Fake eNodeB Attack on LTE Network</i>
	1D.6	158	<i>Performance Analysis FSR and DSR Routing Protocol in VANET with V2V and V2I Models</i>
	2B.8	394	<i>Smart Safe Prototype Based Internet of Things (IoT) with Face and Fingerprint Recognition</i>
J A B C D E F G H I J K L M N O P Q R S T U W X Y Z			
Jati Anggoro, Wisang	1E.7	209	<i>Development of Smart Energy Meter Based on LoRaWAN in Campus Area</i>
Jatmiko, Wisnu	2E.5	520	<i>Indonesian Traffic Sign Recognition For Advanced Driver Assistent (ADAS) Using YOLOv4</i>
Julzarika, Atriyon	2G.5	604	<i>Comparison of the Latest DTM with DEM Pleiades in Monitoring the Dynamic Peatland</i>
K A B C D E F G H I J K L M N O P Q R S T U W X Y Z			
Kamirul, Kamirul	1G.4	284	<i>Modification of 2.2 GHz S-Band Rectangular Patch Microstrip Antenna using Truncated Corner Method for Satellite Applications</i>
	1G.5	289	<i>Design of Optimal Satellite Constellation for Indonesian Regional Navigation System based on GEO and GSO Satellites</i>
Karna, Nyoman	1D.3	140	<i>Experimental Security Analysis for Fake eNodeB Attack on LTE Network</i>
Karo, Ferdinanta	1G.3	278	<i>5G New Radio (NR) Network Planning at Frequency 2,6 GHz in The Gold Triangle Area of Jakarta</i>
Khairunnisa, Syifa	2D.5	471	<i>Removing Noise, Reducing dimension, and Weighting Distance to Enhance k-Nearest Neighbors for Diabetes Classification</i>
Komarudin, Udin	2F.5	551	<i>Development of Temperature and Humidity Control System in Internet-of-Things based Oyster Mushroom Cultivation</i>
Kouty, Shreyus	2C.8	439	<i>Multilayer Secure Hardware Network Stack using FPGA</i>
Krisnadi, Dion	1C.1	89	<i>Website Design for Locating Tuna Fishing Spot Using Naïve Bayes and SVM Based on VMS Data on Indonesian Sea</i>
Kristiani, Eveline	2G.1	577	<i>Case Study: AppDynamics Application as Business Intelligence to Support Digital Business Operations at PT PGD</i>

Kunang, Yesi	1D.4	146	<i>Improving Classification Attacks in IOT Intrusion Detection System using Bayesian Hyperparameter Optimization</i>
Kurniawati, Yulia Ery	1B.1	42	<i>Papaya Disease Detection Using Fuzzy Naïve Bayes Classifier</i>
Kusnandar, Kusnandar	2F.5	551	<i>Development of Temperature and Humidity Control System in Internet-of-Things based Oyster Mushroom Cultivation</i>
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Lagunov, Alexey	3E.1	705	<i>Features of the Use of Solar Panels at Low Temperatures in the Arctic</i>
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Lee, Sang-Gon	1E.3	187	<i>TwoChain: Leveraging Blockchain and Smart Contract for Two Factor Authentication</i>
Lin, Haitao	1A.2	12	<i>Distributed Alternating Direction Multiplier Method Based on Optimized Topology and Nodes Selection Strategy</i>
Lubis, Ainul	2B.3	365	<i>Proximity-based COVID-19 Contact Tracing System Devices for Locally Problems Solution</i>
Lukas, Samuel	1C.1	89	<i>Website Design for Locating Tuna Fishing Spot Using Naïve Bayes and SVM Based on VMS Data on Indonesian Sea</i>
M A B C D E F G H I J K L M N O P Q R S T U W X Y Z			
Mahamad, Abd Kadir	2B.4	371	<i>Development of The Personnel Monitoring System Using Mobile Application and Real-Time Database During the COVID19 Pandemic</i>
Mahardiko, Rahutomo	2G.7	615	<i>Validation of Information Technology Value Model for Petroleum Industry</i>
	2G.6	609	<i>Model Development of Information Technology Value for Downstream Petroleum Industry</i>
	2F.1	534	<i>Effect of Android and Social Media User Growth on the Financial Technology Lending Borrowers and its Financing</i>
Mahersatillah, Andi	3D.2	688	<i>Unstructured Road Detection and Steering Assist Based on HSV Color Space Segmentation for Autonomous Car</i>
Mahfiz, Syiti	2D.8	488	<i>Aspect-based Opinion Mining on Beauty Product Reviews</i>

Manik, Lindung	3A.2	627	<i>Stemming Javanese: Another Adaptation of the Nazief-Adriani Algorithm</i>
Mardhotillah, Rinda	2E.4	514	<i>Speaker Recognition For Digital Forensic Audio Analysis Using Support Vector Machine</i>
Masngut, Ibnu	2B.2	360	<i>Development and Implementation of Kalman Filter for IoT Sensors: Towards a Better Precision Agriculture</i>
Maulana, Eka	1E.7	209	<i>Development of Smart Energy Meter Based on LoRaWAN in Campus Area</i>
Mawaldi, Ikbal	1D.3	140	<i>Experimental Security Analysis for Fake eNodeB Attack on LTE Network</i>
Mootha, Siddartha	3E.4	721	<i>A Stacking Ensemble of Multi Layer Perceptrons to Predict Online Shoppers' Purchasing Intention</i>
Mubarok, Husein	2B.5	377	<i>Prototype Design of IoT (Internet of Things)-based Load Monitoring System</i>
Muchtar, Akhyar	2C.4	418	<i>The Single Tuned Filter Planning to Mitigate Harmonic Pollution in Radial Distribution Network Using Particle Swarm Optimization</i>
Muchtar, Kahlil	2E.3	509	<i>Convolutional Network and Moving Object Analysis for Vehicle Detection in Highway Surveillance Videos</i>
Muflikhah, Lailil	1A.8	37	<i>Prediction of Liver Cancer Based on DNA Sequence Using Ensemble Method</i>
Muharram, Muh.	2D.4	467	<i>Firefly Algorithm-based Optimization of Base Transceiver Station Placement</i>
Mujahidin, Irfan	1A.2	7	<i>Blackbox Testing Model Boundary Value of Mapping Taxonomy Applications and Data Analysis of Art and Artworks</i>
Muladi, Muladi	2B.4	371	<i>Development of The Personnel Monitoring System Using Mobile Application and Real-Time Database During the COVID19 Pandemic</i>
Mulyanto, Agus	2E.5	520	<i>Indonesian Traffic Sign Recognition For Advanced Driver Assistent (ADAS) Using YOLOv4</i>
Munadi, Rendy	1D.7	164	<i>DDoS Attack Detection in Software Defined Network using Ensemble K-means++ and Random Forest</i>
Mungkasi, Sudi	2A.2	321	<i>Some Numerical and Analytical Solutions to an Enzyme-Substrate Reaction-Diffusion Problem</i>
Mursanto, Petrus	2E.5	520	<i>Indonesian Traffic Sign Recognition For Advanced Driver Assistent (ADAS) Using YOLOv4</i>

Murwantara, I Made	1C.1	89	<i>Website Design for Locating Tuna Fishing Spot Using Naïve Bayes and SVM Based on VMS Data on Indonesian Sea</i>
Mustika, I Wayan	1E.5	198	<i>Roadside Unit Power Saving using Vehicle Detection System in Vehicular Ad-hoc Network</i>
	1E.8	215	<i>Performance Enhancement in Macro-Femto Network Using a Modified Discrete Moth-flame Optimization Algorithm</i>
	1E.7	209	<i>Development of Smart Energy Meter Based on LoRaWAN in Campus Area</i>
	1D.2	135	<i>Interference Mitigation in Cognitive Radio Network Based on Grey Wolf Optimizer Algorithm</i>
	2G.4	599	<i>Application For Detection Of Pedestrian Position On Zebra Cross</i>
Muthchamy Sellamuthu, Karthika Devi	3E.4	721	<i>A Stacking Ensemble of Multi Layer Perceptrons to Predict Online Shoppers' Purchasing Intention</i>
Muttaqin, Didik	2D.3	463	<i>Speech Emotion Detection Using Mel-Frequency Cepstral Coefficient and Hidden Markov Model</i>
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N. Fathee, Hala	3B.4	655	<i>A Robust Iris Segmentation Algorithm Based on Pupil Region for Visible Wavelength Environments</i>
Nafi'iyah, Nur	3C.2	661	<i>The Use of Pre and Post Processing to Enhance Mandible Segmentation using Active Contours on Dental Panoramic Radiography Images</i>
Nagy, Adam	3A.3	632	<i>A bio-motivated vision system and artificial neural network for autonomous UAV obstacle avoidance</i>
Najmurokhman, Asep	2F.5	551	<i>Development of Temperature and Humidity Control System in Internet-of-Things based Oyster Mushroom Cultivation</i>
Nam, Andrew	1A.1	1	<i>Resource-Aware Pareto-Optimal Automated Machine Learning Platform</i>
Nasaruddin, Nasaruddin	2E.3	509	<i>Convolutional Network and Moving Object Analysis for Vehicle Detection in Highway Surveillance Videos</i>
Nashiruddin, Muhammad Imam	1F.6	251	<i>Performance Evaluation of XGS-PON Optical Network Termination for Enterprise Customer</i>
	1F.4	239	<i>Performance Evaluation of IPTV Multicast Service Testing for XGS-PON Optical Line Termination</i>
Nasr-Azadani, Mohamad	1A.1	1	<i>Resource-Aware Pareto-Optimal Automated Machine Learning Platform</i>

Nasri, Muhammad	2B.1	354	<i>The User Experience effect of Applying Floating Action Button (FAB) into Augmented Reality Anatomy Cranium Media Learning Prototype</i>
Nguyen-Quoc, Huy	2D.1	451	<i>Gender recognition based on ear images: a comparative experimental study</i>
Nivaan, Goldy Valendria	1C.4	106	<i>Analytic Predictive of Hepatitis using The Regression Logic Algorithm</i>
Noer, Astriany	1G.4	284	<i>Modification of 2.2 GHz S-Band Rectangular Patch Microstrip Antenna using Truncated Corner Method for Satellite Applications</i>
	1G.5	289	<i>Design of Optimal Satellite Constellation for Indonesian Regional Navigation System based on GEO and GSO Satellites</i>
NQ, Mohammad Arifin	3A.2	627	<i>Stemming Javanese: Another Adaptation of the Nazief-Adriani Algorithm</i>
Nugraha, Syechu	2C.3	412	<i>Design and Implementation of SVPWM Inverter to Reduce Total Harmonic Distortion (THD) on Three Phase Induction Motor Speed Regulation Using Constant V/F</i>
	2C.2	406	<i>Three Phase Induction Motor Dynamic Speed Regulation Using IP Controller</i>
Nugroho, Hanung	2E.2	499	<i>Supervised Deep Learning for Thyroid Nodules Classification Based on Margin Characteristic</i>
Nugroho, Lukito	2G.3	593	<i>Multi-Point Travel Destination Recommendation System In Yogyakarta Using Hybrid Location Based Service-Floyd Warshall Method</i>
	2G.4	599	<i>Application For Detection Of Pedestrian Position On Zebra Cross</i>
Nur, Darfiana	2A.1	310	<i>On Parameter Estimation of Stochastic Delay Difference Equation using the Two m-delay Autoregressive Coefficients</i>
Nurdewanto, B.	1A.2	7	<i>Blackbox Testing Model Boundary Value of Mapping Taxonomy Applications and Data Analysis of Art and Artworks</i>
Nurfadillah, Raditya	2D.2	457	<i>Benchmarking Explicit Rating Prediction Algorithms for Cosmetic Products</i>
Nurlina, Elin	2F.5	551	<i>Development of Temperature and Humidity Control System in Internet-of-Things based Oyster Mushroom Cultivation</i>

Nurmaini, Siti	1D.4	146	<i>Improving Classification Attacks in IOT Intrusion Detection System using Bayesian Hyperparameter Optimization</i>
Nurtiyasari, Devi	3C.3	667	<i>COVID-19 Chest X-Ray Classification Using Convolutional Neural Network Architectures</i>
Nurwarsito, Heru	1E.1	176	<i>Performance Analysis of Temporally Ordered Routing Algorithm Protocol and Zone Routing Protocol On Vehicular Ad-Hoc Network in Urban Environment</i>
Nusantara, Damai	2C.5	423	<i>Analysis of Performance Index in Transmission Expansion Planning of Sulawesi's Electricity System</i>
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Octarina, Sisca	2A.1	315	<i>The N-Sheet Model in Capacitated Multi-Period Cutting Stock Problem with Pattern Set-Up Cost</i>
Oktian, Yustus	1E.3	187	<i>TwoChain: Leveraging Blockchain and Smart Contract for Two Factor Authentication</i>
Osman, Safaa	1B.7	68	<i>Risk Prediction of Major Depressive Disorder using Artificial Neural Network</i>
P A B C D E F G H I J K L M N O P Q R S T U W X Y Z			
Perkasa, Gregorius	1D.2	135	<i>Interference Mitigation in Cognitive Radio Network Based on Grey Wolf Optimizer Algorithm</i>
Permana, Indra	2F.1	534	<i>Effect of Android and Social Media User Growth on the Financial Technology Lending Borrowers and its Financing</i>
Permanasari, Adhistya	2B.1	354	<i>The User Experience effect of Applying Floating Action Button (FAB) into Augmented Reality Anatomy Cranium Media Learning Prototype</i>
Petho, Mate	3A.3	632	<i>A bio-motivated vision system and artificial neural network for autonomous UAV obstacle avoidance</i>
Prakoso, Rahardi	1D.8	170	<i>Measurement of Information Security Awareness Level: A Case Study of Online Transportation Users</i>
Pramono, Subuh	2C.6	428	<i>Design and Development of Bit Error Measurement using FPGA for Visible Light Communication</i>
Prasetya, Suisbiyanto	1G.4	284	<i>Modification of 2.2 GHz S-Band Rectangular Patch Microstrip Antenna using Truncated Corner Method for Satellite Applications</i>
Prasetyawan, Purwono	2E.5	520	<i>Indonesian Traffic Sign Recognition For Advanced Driver Assistent (ADAS) Using YOLOv4</i>

Prasetyo, Wisnu	2A.8	348	<i>Students Academic Performance Prediction with k-Nearest Neighbor and C4.5 on SMOTE-balanced data</i>
Prasojo, Radityo Eko	2D.2	457	<i>Benchmarking Explicit Rating Prediction Algorithms for Cosmetic Products</i>
Pratama, Denni	1A.4	17	<i>Comparison of PSO, FA, and BA for Discrete Optimization Problems</i>
Pratama, Gilang	2B.2	360	<i>Development and Implementation of Kalman Filter for IoT Sensors: Towards a Better Precision Agriculture</i>
Pratama, Raditya	2G.3	593	<i>Multi-Point Travel Destination Recommendation System In Yogyakarta Using Hybrid Location Based Service-Floyd Warshall Method</i>
Pratama, Yogaswara	2G.1	577	<i>Case Study: AppDynamics Application as Business Intelligence to Support Digital Business Operations at PT PGD</i>
Pratiwi, Melati	3C.4	677	<i>Classification of Customer Actions on Digital Money Transactions on PaySim Mobile Money Simulator using Probabilistic Neural Network (PNN) Algorithm</i>
Priyadi, Ardyono	3E.3	716	<i>Energy Management Efficiency and Stability Using Passive Filter in Standalone Photovoltaic Sudden Cloud Condition</i>
Priyadi, Yudi	2A.5	332	<i>Extraction Dependency Based on Evolutionary Requirement Using Natural Language Processing</i>
Priyambodo, Tri	1F.1	221	<i>Designing Wireless Sensor Network Routing on Agriculture Area Using The LEACH Protocol</i>
	1D.1	129	<i>Real-time Testing on Improved Data Transmission Security in the Industrial Control System</i>
Prutphongs, Ponsuda	2G.2	588	<i>Decision Support System for Power Plant Improvement Investment Using Life-Cycle Cost</i>
Pujianto, Utomo	2A.8	348	<i>Students Academic Performance Prediction with k-Nearest Neighbor and C4.5 on SMOTE-balanced data</i>
Purnomo, Hindriyanto	1F.7	257	<i>Detection of Sensor Node-less Area Using A Genetic Algorithm for Wireless Sensor Network</i>
	3D.4	700	<i>A Modified Deep Convolutional Network for Covid-19 detection based on chest X-ray images</i>
Purwanto, Era	2C.3	412	<i>Design and Implementation of SVPWM Inverter to Reduce Total Harmonic Distortion (THD) on Three</i>

			<i>Phase Induction Motor Speed Regulation Using Constant V/F</i>
	2C.2	406	<i>Three Phase Induction Motor Dynamic Speed Regulation Using IP Controller</i>
Purwanto, Yudha	1D.7	164	<i>DDoS Attack Detection in Software Defined Network using Ensemble K-means++ and Random Forest</i>
Puspita, Fitri Maya	2F.5	556	<i>Modification of Wireless Reverse Charging Scheme with Bundling Optimization Issues</i>
Puspitasari, Novianti	2D.7	482	<i>Dayak Onion (Eleutherine palmifolia (L) Merr) as An Alternative Treatment in Early Detection of Dental Caries using Certainty Factor</i>
Putra, Agfianto	1D.1	129	<i>Real-time Testing on Improved Data Transmission Security in the Industrial Control System</i>
Putranto, Bambang Purnomosidi Dwi	2B.6	383	<i>A Comparative Study of Java and Kotlin for Android Mobile Application Development</i>
Putranto, Lesnanto Multa	2C.5	423	<i>Analysis of Performance Index in Transmission Expansion Planning of Sulawesi's Electricity System</i>
	2C.1	400	<i>Minimization of Power Losses through Optimal Placement and Sizing from Solar Power and Battery Energy Storage System in Distribution System</i>
Putri, Andi	2C.4	418	<i>The Single Tuned Filter Planning to Mitigate Harmonic Pollution in Radial Distribution Network Using Particle Swarm Optimization</i>
Q A B C D E F G H I J K L M N O P Q R S T U W X Y Z			
Qomariyah, Nunung Nurul	1C.8	123	<i>Predicting User Preferences with XGBoost Learning to Rank Method</i>
Qudsi, Ony	2C.3	412	<i>Design and Implementation of SVPWM Inverter to Reduce Total Harmonic Distortion (THD) on Three Phase Induction Motor Speed Regulation Using Constant V/F</i>
	2C.2	406	<i>Three Phase Induction Motor Dynamic Speed Regulation Using IP Controller</i>
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A Comparative Study of Java and Kotlin for Android Mobile Application Development

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Abstract— There are several programming languages that can be used to develop Android application, such as C++, Java, Kotlin, JavaScript, and many more. Each programming language certainly has some advantages and disadvantages in the development of Android application. Therefore, a comparison to see the values of those programming languages is needed. This research compared two popular programming languages for Android application development, namely Java and Kotlin. The testing was done by building two applications using Java and Kotlin that access data in a remote server. Our comparison includes source code evaluation, testing on the performance of the app performed on two devices, and testing on the data usage. From the test results, it was proved that Kotlin is superior in terms of more concise lines of code and less data usage which will reduce bugs substantially therefore will lead to faster development time. On the other hand, Java is superior in its compiling time (for first time build but on par with Kotlin for incremental build) and APK size albeit not significant. We also compare ecosystem and programming language constructs for both programming languages. Overall, for Android mobile application development, Java should be used if mobile application development priority is the APK size and compilation / build time while Kotlin should be used if mobile application development priority is lesser bugs, concise code, and faster development time.

Keywords— *Programming Language, Java, Kotlin, Android, Comparison.*

I. INTRODUCTION

Programming language plays an important role in developing an application and allows programmers to provide computer-understandable instructions and allow computers to process large and complex information quickly and efficiently [1], [2], [3]. Programming language is considered as a means of expressing computations in a comprehensible form for both people and machines. Much like human language, there are many computer programming languages which can be used by programmers to communicate with computers [4], [5]. The syntax of a language specifies how various sorts of phrases (expressions, commands, declarations, etc.) are combined to form programs [6], [7].

Some programming languages that can be used to develop Android applications are Java and Kotlin. Java is an object-oriented programming language (and currently also includes functional programming) that lifts objects that exist in the real world and has good flexibility as one of the programming languages because of its multiplatform; which means that it can be run on various platforms, such as: Linux, Windows, Solaris, and various mobile devices without having to change the existing code, which is commonly referred to the term "write once, run anywhere" [8], [9]. By compiling source code into intermediate Java byte code, and then executing it on a virtual machine on the target system, Java provides portability and platform independency which few other languages can offer [10]. However, Java is a verbose language, thus one of the main drawbacks of the language is that even simple tasks often need a significant amount of code. To allow programmers to write concise code, JetBrains created a new language named Kotlin [11]. Kotlin has more modern language features than Java. Kotlin is a pragmatic programming language that combines object-oriented (OO) and functional programming [12], [13]. Kotlin has attracted many developers because of its simple syntax and its main focus on mobile development in the beginning. Yet, it is mainly because of its compatibility with Java [14], [15].

In this study, the authors used an application to display international actors and artists that are at the peak of their career, the application will feature photos of 20 actors and the best international artist according to The Movie Database (TMDb).

II. BACKGROUND

A. Java

Java is a language and a platform originated by Sun Microsystems [16], [17], [18]. Java language is an object-oriented programming language created by James Gosling and several other engineers at Sun Microsystems. Java was first developed in 1991 as part of the Green Project. Initially, Java was designed to replace the C++ language and it was known as Oak.

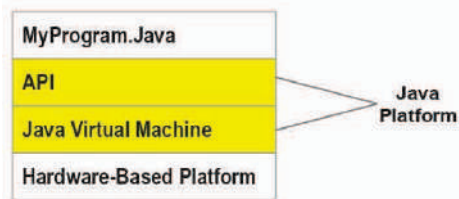


Fig. 1. Java Platform

Java platform is different from most other platforms. Within the Java platform, the software platform runs on top of the hardware-based platform. Most other platforms are a combination of hardware and operating systems. Java Platform has two components [19]:

1. Java Virtual Machine (JVM)
2. Java Application Programming Interface (Java API)

Java API is a collection of ready-made software components that provides a variety of facilities, such as: many GUI widgets, collections data structures, and many more. The Java API is grouped in the packages of related components [20], [21], [22], [23].

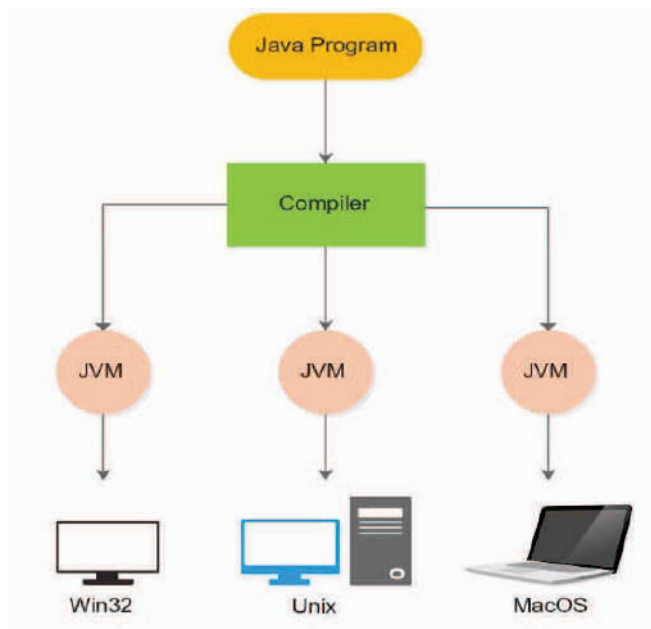


Fig. 2. Java Multiplatform

As can be seen in Fig. 2 above, Java program runs on top of the Java platform. Java Platform isolates Java programs with hardware, so Java programs do not rely on hardware independently. Java has several advantages when compared to other programming languages, such as: object-oriented language, multithreading, garbage collector support, statically typed, multiplatform.

B. Kotlin

Kotlin is a statically typed programming language that targets Java Virtual Machine (JVM), Android, JavaScript, and Native. At first, Kotlin was developed by JetBrains and Kotlin project was started in 2010. Then it became an open-source programming language. Kotlin version 1.0 was officially released in February 2016. Kotlin is a great fit for developing Android applications, bringing all of the advantages of a modern language to the Android platform without introducing any new restrictions like compatibility,

performance, interoperability, footprint, compilation time and learning curve [24]. Kotlin is compiled to Java byte-code, which means that an application written in Kotlin can be executed on the Java virtual machine, and Kotlin is fully interoperable with Java [25], [26], [27]. As a result, Kotlin becomes very easy to get into for developers. As with the full interoperability with Java, it becomes very easy to get into the language by migrating small parts of the code into Kotlin [28].

C. The Movie Database (TMDb)

The Movie Database (TMDb) is an online database that provides information related to movies and TV programs [29]. The information provided among other popular movies and TV listings, detailed information, such as: release date, director, movie star, actor, synopsis, photos, video trailers, etc. TMDb provides API services so that the application developers can add information about movies and TV programs on their applications. Since 2008, TMDb has been used by more than 200.000 developers and companies.

D. Android Profiler

Android Studio has a great tool for application profiling. In addition, it provides the closest metal-to-metal interface with the mobile Android device. However, its usage is not simple and therefore, it becomes the third profiling tools compared to other tools. Android profiler provides real-time data applications, such as: CPU usage, memory, network, and battery. Android Profiler helps developers in measuring application performance [30].

III. RESEARCH METHODOLOGY

This research will develop two applications in which each represents the programming examples languages of Java and Kotlin. Both applications have the same requirements and end results so they can be analyzed and compared for their performance. Research flows in this study can be seen in Fig. 3.

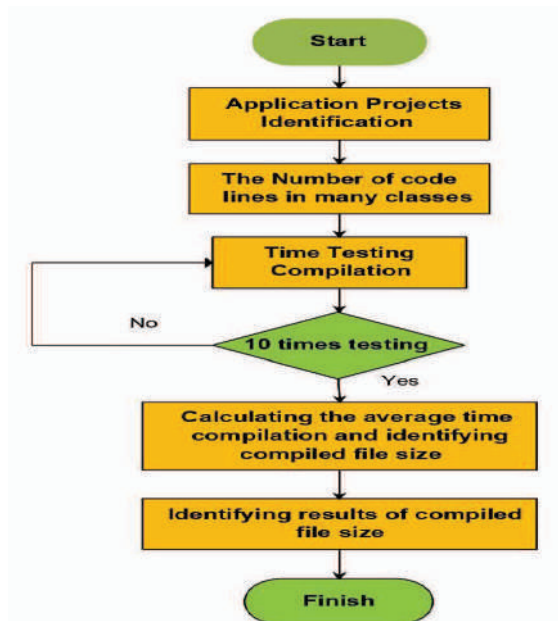


Fig. 3. Research Flows

A. Literature Review

The purpose of a literature review is to gain an understanding of the existing research and debates relevant to a particular topic or area of study and to present that knowledge in a written report form. In this study, many research papers, on-line articles, and previous projects on different topics are reviewed to come up with an appropriate solution of how programming languages affect application performance.

B. Applied Methodology

This stage aims to analyze the application needs, design of the system as a whole, application implementation, and runtime testing to ensure that the application used is running based on the particular requirements. The application is a popular person application, a useful application for showcasing popular people in the world. Applications are built using Java and Kotlin programming language. Next, both applications will be measured by their performance measurement and efficiency performance to determine which application and efficiency performance are better. A Use Case diagram in Fig. 4 is created to describe interactions between users and applications. In general, the application takes personal data obtained from a server and users can only see the person's data.

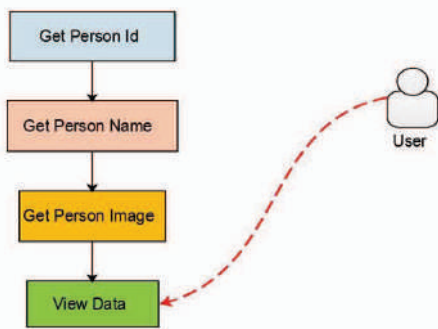


Fig. 4. Use Case Diagram

C. Experiment

Experiments are performed by performing performance measurements on individual Java and Kotlin applications in Android studio which uses Gradle for build tools and an emulator to run the application. The measurement scenario is to do application coding and building for 10 sessions. In each coding and building session, we change some source code for feature addition and/or bugs fixes (done on purpose to record incremental build). For those 10 sessions, the results for compilation and build time are averaged. Application with fewer number of lines of code, fewer number of classes and lower compilation and build time is considered as an application with better performance.

Experiments are performed using Oracle JDK 1.8.0 update 271, targeting Android SDK version 27. For Kotlin, we use the latest Kotlin version (1.4.10) as of november 2020 on Oracle JDK 1.8.0 update 271. We use Gradle 6.7 for our build tools. For hardware, our experiments are performed on two devices with specification:

Table 1. Device Specifications

Device A	Device B
Processor Intel®Core™i5-5200U CPU @2.20GHz 2.19GHz	Intel® Core™ i3-6006U CPU @ 2.00GHz

Random Access Memory (RAM) 8,00 GB	Random Access Memory (RAM) 4,00 GB
SSD 256 GB	Hard Disk 1 Terabyte
Hard Disk 1 Terabyte	

IV. RESULT AND ANALYSIS

Data processing and presentation are obtained from the experiment results for compilation time and lines of code while ecosystem and programming language constructs are based on current available resources. Based on the resulting data, the performance of both applications can be seen. Our analysis will show which programming language is more efficient to be used on Android-based application development. Our measurements are done by building applications on each programming language; Java and Kotlin. Next, we measure the application's efficiency by running the application. The metrics itself is obtained by using lines of code, class, and compilation time in Android Studio.

A. Compilation Time and APK Size Results

Comparison for compilation time on the application project applied to both programming languages at two computers showed that Java is superior in 10 times testing compared to Kotlin as shown in Fig. 5. First compilation always has the longest compilation time since Gradle will fetch any libs (.jar) needed for compilation. Subsequent compilation time is reduced significantly since Gradle caches all unchanged results and only builds the changed parts.

Table 2. Compilation Time (in seconds)

Testing	Device A		Device B	
	Java	Kotlin	Java	Kotlin
Test 1	46.592	76.592	16.212	26.212
Test 2	1.775	3.775	1.358	2.358
Test 3	1.744	2.744	1.270	2.270
Test 4	1.582	2.582	1.187	2.187
Test 5	1.555	2.555	1.133	2.133
Test 6	1.552	2.552	1.166	2.166
Test 7	1.241	2.241	1.480	2.480
Test 8	1.438	2.438	1.182	2.182
Test 9	1.126	2.126	1.250	2.250
Test 10	1.120	2.120	1.840	2.840
Average	5.973	9.973	2.808	4.708

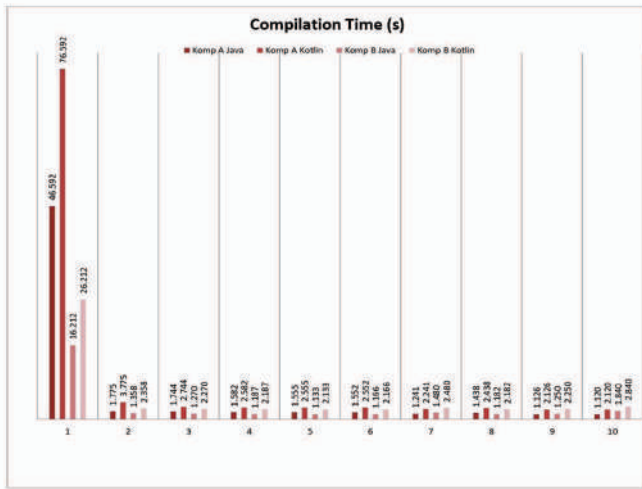


Fig. 5. Compilation Time Comparison

The final results of the APK size between the Java and Kotlin versions differ by about 77%. The Java version is 1,809,987 KB in size and the Kotlin version is 2,349,921 KB.

B. Lines of Code

For lines of code comparison in application projects for both programming languages, Java's lines of code is 8624 lines compared to Kotlin with 8055 lines of code. Therefore, in this case Kotlin is superior to Java as it is shown in Fig. 6.

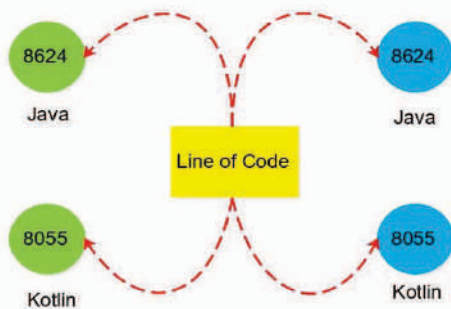


Fig. 6. Lines of Code Comparison

C. Number of Class

A comparison chart for the number of classes on application projects in both languages showed that Java has more classes since it uses 30 classes, while Kotlin only uses 22 classes. Therefore, it can be concluded that Kotlin is superior to Java as it can be seen in Fig. 7.

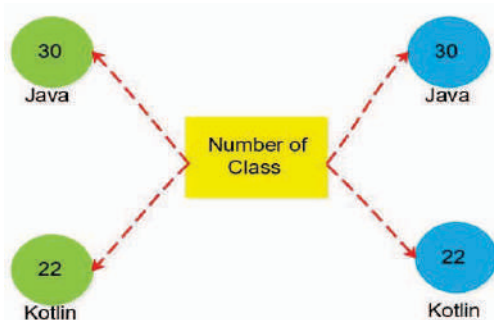


Fig. 7. Number of Class Comparison

D. Ecosystem

Both programming languages are JVM programming languages and both are officially supported by Google for Android application development. It implies that both are interoperable, means Kotlin can use Java libraries and vice versa. In this regard, all maven repositories can be used by both programming languages.

For IDE, currently Android Studio supports both programming languages, therefore, Java and Kotlin are supported from initial projects, during iterative development, debugging, profiling, and packaging for deployment. If developers prefer development without Android Studio, many available development tools exist to support this kind of development - for example SpaceVim enables syntax highlighting, completion, and many more using LSP (Language Server Protocol) for both Java and Kotlin.

For application development, even though we do not discuss multi platform development in this paper, note that Kotlin has more mature framework which is free and open source (KMM - Kotlin Multi Mobile)¹ while Java has similar free - proprietary commercial offering with Gluon Mobile². This has to be considered upfront before application development is started.

E. Programming Language Constructs

Effective development and less development time are usually attributed to programming language constructs. We discuss comparison between Java and Kotlin in Table 3. Note that we use JDK 8 and Kotlin 1.4.10 for this comparison. We compare standard programming language constructs without third party libraries and add-ons. We use Kotlin documentation³ and Java documentation⁴ for this purpose.

Table 3. Comparison of Programming Language Constructs

Parameter	Java	Kotlin
Compilation target	Bytecodes for JVM. Native target available using GraalVM	Bytecodes for JVM, native, JavaScript
Null safety	No	Yes
Lambda expressions	No	Yes, also inline functions
Extension functions	No	Yes
Smart casts	No	Yes
Invariant array	No	Yes
Non-private field	Yes	No, forces setter and getter for properties.
Static member	Yes	No, but can be replaced with companion objects, top-level

¹ <https://kotlinlang.org/lp/mobile/>

² <https://gluonhq.com/products/mobile/>

³ <https://kotlinlang.org/docs/reference/comparison-to-java.html>

⁴ <https://docs.oracle.com/javase/8/>

		functions, extension functions, or @JvmStatic
Wildcard types	Yes	No, but can be replaced with declaration-site variance and type projections
Singletons objects	Yes	Yes
Checked exceptions	Yes	No
Primitive types that are not classes	Yes	No
Ternary operator	Yes	No, but can be replaced with if .
Raw types	Yes	No
Properties	No	Yes
Primary constructors	No	Yes
String template	No	Yes
First-class delegation	No	Yes
Type inference for variable and property types	No	Yes
Declaration-site variance & type projections	No	Yes
Range expressions	No	Yes
Operator overloading	No	Yes
Companion objects	No	Yes
Data classes	No	Yes
Separate interfaces for read-only and mutable collections	No	Yes
Coroutines	No	Yes
Verbosity	Very verbose	Concise

V. CONCLUSION

Based on the research that has been done, it can be concluded as follows:

1. Testing on an application project showed that Kotlin is superior in terms of lines of code and the number of classes while Java is superior in terms of compilation time and APK size although they are not too significant.
2. Ecosystem for both programming languages is complete and interoperability between Kotlin and Java is easy and seamless, therefore both can use available development tools, libraries, and frameworks. However, for multi platform development, Kotlin is better in framework support as KMM is freely available and fully supported.

3. From a programming language constructs point of view, Kotlin has more advantages and less disadvantages compared with Java. Also, source code for Java is far more verbose than Kotlin which can lead to more bugs and / or code smell.
4. Based on the overall measurement results, it can be concluded that Java should be used if mobile application development priority is the APK size and compilation / build time while Kotlin should be used if mobile application development priority is lesser bugs, concise code, and faster development time.

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Dr. Bambang Purnomosidi DP., S.Kom., S.E., M.Msi.
Conference Chair



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