

X. ARTIFICIAL INTELLIGENCE (AI) SECTOR

A. AI PINAS: AI Robotics Enabling Solutions for Emerging Needs

DOST-PCIEERD covers 21 sectors generally categorized under industry, energy, emerging technology, and special concerns. We have a wide sectoral coverage that include almost everything except for health and agriculture which is covered by the other sectoral councils of DOST. Artificial Intelligence is one of its priority sectors under emerging technology.

AI is one of PCIEERD's priority areas because it is tagged as one of the important technologies that will usher the country to the fourth industrial revolution. Although considered as powerful agent for good, AI can also disrupt traditional business models and processes, thereby making it a threat. And in order to maximize the benefits of AI, there is a need to develop our capability in this area.

In the latest Asia Pacific AI Readiness Index Report, 2019, the Philippines earned an overall readiness score of 44.2 out of a hundred, ranking sixth among other countries including Singapore, Hong Kong, India, Malaysia, Thailand, and Indonesia.

To start with the goal of building a community of skilled experts that can increase the country's global competitiveness in the field, DOST-PCIEERD initiated its series of training courses on data science, machine learning, deep learning and AI in general. This was done in partnership with MOOCs PH, Coursera, Google Philippines, Thinking Machines, Inc. and the PCIEERD AI Board of experts.

To date, two (2) AI R&D projects were completed and seven (7) more are being supported by DOST-PCIEERD.

Call Rationale

Artificial intelligence (AI) and robotics are a powerful combination for automating tasks inside and outside of the factory setting. In recent years, AI has become an increasingly common presence in robotic solutions, introducing flexibility and learning capabilities in previously rigid applications. In the global market, major AI investments are on business and health care followed by finance and cyber security. Other AI applications supported include recreation, sports, social network, education, smart home, and public safety. But in the Philippines, AI for disaster risk management and infrastructure are our main priority for 2022-2024. This is aligned with the Philippine Development Plan (2017-2022) to continue building the capacities of disaster risk reduction and management (DRRM) stakeholders and improve their coordination services. This program is likewise aligned with the Harmonized National R&D Agenda (2018-2022) to increase relevant stakeholders and industry competitiveness through emerging technologies.

Call Objectives

Proposed projects must develop technologies on the following priority areas with specific applications preferably for disaster risk management and infrastructure.

Call Scope

Possible Applications for DRM

- **AI Applications for DOST-PAGASA**

- 1) Hydrometeorological Hazards

- a. Urban and River flooding
 - i. AI-based Flood Forecasting (near-real time) to LGUs
 - ii. Risk Assessment of Urban and River flooding- Nationwide or in a pilot site
 - iii. Street level/ barangay level/community level near-real time river monitoring and early warning system for all rivers nationwide
- b. Thunderstorms Early Warning System thru AI (readily- felt by the public)
- c. Cloud/Thunderstorms/Typhoons High-resolution Near Real-time Mapping/Monitoring and Forecasting: Micro weather
- d. Integration of algorithms for PAGASA data (maps, models, ground as well as remotely- sensed data etc) in the past decades with methodology for training/validation datasets:
 - i. Flooding (as main priority), landslide, severe wind and storm surge
- e. Dams Water Release and River/Tributary Control Systems
- f. Scenario/simulations for rivers/dams crisis with plan of action
- g. Optimization of Forecast for Ship-routing
- h. Bow Echo Detection for Tornado Warning

- 2) Climate Change

- Impact-based Forecasting: landslide, flooding, severe wind and storm surge

- 3) Sub-seasonal Forecasting

- Deep learning applications for dynamical models/ regional models using AI
- Validation/Verification of Models

- 4) Chatbot development for PAGASA services

- **AI Applications for DOST-PHIVOLCS**

- Deep learning approach for automatic recognition of seismo-volcanic events: earthquake signals from a volcano observatory or satellite/ remotely- sensed images such as SAR
- Image recognition studies from PHIVOLCS sensors' outputs
- AI on RADAR Interferometry for monitoring earthquake-related deformation
- Automated Extraction of features from remotely- sensed data for Hazard and Risk Assessments in the GeoRiskPH portal
- Automated extraction of satellite data addressing PHIVOLCS' needs including but not limited to labeling of features, extraction of features, and analysis of trends
- Automated IfSAR analysis for Ground Deformation/ Landslides/ Ground Movement
- Satellite monitoring assisted by Deep Learning: a tool to help anticipate volcanic eruption
- Digitization of seismographs and seismograms to capture distance, depth and mechanism of events as training data for AI

- **AI Applications for DPWH**

The potential applications of machine learning and AI in construction are vast. Requests for information, open issues, and change orders are standard in the industry. Machine learning is like a smart assistant that can scrutinize this mountain of data. It then alerts project managers about the critical things that need their attention. Several applications already use AI are enumerated.

- **Better design of buildings through Generative Design**

The industry is trying to use machine learning in the form of generative design to identify and mitigate clashes between the different models generated by the different teams in the planning and design phase to prevent rework. [There is software](#) that uses machine learning algorithms to explore all the variations of a solution and generates design alternatives. It leverages machine learning to specifically create 3D models of mechanical, electrical, and plumbing systems while simultaneously making sure that the entire routes for MEP systems do not clash with the building architecture while it learns from each iteration to come up with an optimal solution.

- **Risk mitigation**

Every construction project has some risk that comes in many forms such as Quality, Safety, Time, and Cost Risk. The larger the project, the more risk, as there are multiple sub-contractors working on different trades in parallel on job sites. There are AI and machine learning solutions today that general contractors use to monitor and prioritize risk on the job site, so the project team can focus their limited time and resources on the biggest risk factors. AI is used to automatically assign priority to issues. Subcontractors are rated based on a risk score so construction managers can work closely with high-risk teams to mitigate risk.

- **Project planning**

The company uses robots to autonomously capture 3D scans of construction sites and then feeds that data into a deep neural network that classifies how far along different sub-projects are. If things seem off track, the management team can step in to deal with small problems before they become major issues. Algorithms of the future will use an AI technique known as “reinforcement learning.” This technique allows algorithms to learn based on trial and error. It can assess endless combinations and alternatives based on similar projects. It aids in project planning since it optimizes the best path and corrects itself over time.

- **Construction safety**

Developing an algorithm that analyzes photos from its job sites, scans them for safety hazards such as workers not wearing protective equipment and correlates the images with its accident records. This can potentially compute risk ratings for projects so safety briefings can be held when an elevated threat is detected.

- **Post-construction**

Building managers can use AI long after the construction of a building is complete. Building information modeling, or BIM, stores information about the structure of the building. AI can be used to monitor developing problems and even offers solutions to prevent problems.

Specific Requirements: To ensure that the research output will be utilized by the target industry or local regulatory agency, a letter of commitment must be secured. The proponent should be able to secure training data sets from the target partner institution (DPWH, PHIVOLCS or PAGASA).

PCIEERD shall fund at most 4 projects for each target beneficiary agency, and duration should not exceed 2 years with a maximum budget of 10M each proposal

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