Albert Poulose

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Research profile

- **Research vision:** Build an independent research program on **dynamic security of converter-dominated power systems**, combining classical stability theory with physics-informed and measurement-aware scientific AI for online assessment and digital twins.
- **Research program** (three pillars):
  - **I. Modern grid stability**: transient and small-signal security; GFM/GFL interactions; low-inertia and weak-grid challenges.
  - **II. Scientific AI for grid dynamics**: PINNs and hybrid physics-data models; trajectory surrogates; inertia/damping and system identification.
  - **III. Grid digital twins**: measurement-informed (e.g. PMU) updates; online TSA/CCT and security margins; decision-support workflows.
- **Independence and agenda:** First-author publications spanning synchronizing-torque TSA, converter energy-function analysis, and PINN-based TSA/CCT. Current postdoctoral agenda extends these directions beyond the Ph.D. thesis toward multimachine PINNs, parameter estimation, and converter-dominated surrogates suitable for international collaboration and Transactions-level dissemination.
- **Teaching:** Undergraduate lecture courses with full assessment ownership (KNU Lecturer; prior Assistant Professor in India); MATLAB/Python demonstrations; student mentoring. Prepared to teach power-system analysis/stability, renewables/smart grids, control, numerical methods, and AI for power systems.

Academic appointments

2025.03 to Present — **Postdoctoral Researcher** : **Kyungpook National University**, Daegu, South Korea
Microgrid Research Center, Department of Electrical Engineering
Concurrent fixed-term Lecturer appointment Mar 2025 to Feb 2026 (completed).

- Independent postdoctoral agenda on PINN/ML dynamic surrogates for TSA, trajectory prediction, and CCT; multimachine and parameter-estimation extensions in progress.
- Converter-dominated and low-inertia stability research (GFM/GFL) with Python-centric simulation; first-author journal/conference publications.

2025.03 to 2026.02 — **Lecturer** (UG) : **Kyungpook National University**, Daegu, South Korea
Logic Circuits (69 students); Numerical Analysis (26 students): full course ownership, LaTeX Beamer materials, assessments, MATLAB/Python demos.

2020.03 to 2025.02 — **Graduate Research Assistant** (Ph.D.) : **Kyungpook National University**, Daegu, South Korea
Smart Power Systems Lab Supervisor: Prof. Soobae Kim

- First-author thesis research on multimachine synchronizing-torque TSA and converter TEF analysis for renewable-connected systems.
- MATLAB/Simulink and Python workflows; peer-reviewed journal and conference outputs forming a coherent stability → converter → scientific-AI trajectory.

2019.07 to 2020.01 — **Assistant Professor** (UG) : Affiliated college of **APJ Abdul Kalam Technological University**, Kerala, India
Linear Control Systems; Electric Hybrid Vehicles: lectures, tutorials, assessments, mentoring.

2017.08 to 2019.06 — **Teaching Assistant** : Government Engineering College, Thrissur (KTU), India
UG labs, tutorials, and assessment support during M.Tech. studies.

Education

2020.03 to 2025.02 — **Ph.D., Electronic and Electrical Engineering** - **Kyungpook National University**, Daegu, South Korea
School of Electronic and Electrical Engineering
Thesis: Multifaceted Transient Stability Analysis of Power Systems: A Study of Synchronizing Torque in Conventional Systems and Energy Functions in Renewable Connected Systems
GPA: 4.18/4.5

2017.08 to 2019.06 — **M.Tech, Power Systems** - **APJ Abdul Kalam Technological University**, Kerala, India
Government Engineering College, Thrissur
GPA: 7.84/10
Thesis: Higher-order Sliding Mode Based Load Frequency Control for a Two-area Interconnected Power System

2011.07 to 2015.05 — **B.Tech, Electrical and Electronics Engineering** - **Mahatma Gandhi University**, Kerala, India
SCMS School of Engineering and Technology, Ernakulam
GPA: 6.95/10

Publications

4 journal articles | 3 conference papers | Google Scholar: 59 citations, h-index 4, i10-index 3 (as of Aug. 2026).

Journal Articles

1. A. Poulose and S. Kim, "Unified physics-informed trajectory surrogate for transient stability assessment and critical clearing time estimation on a single-machine infinite-bus benchmark," *IEEE Access*, vol. 14, pp. 122 177–122 196, 2026. DOI: 10.1109/ACCESS.2026.3718419
2. A. Poulose and S. Kim, "Direct transient stability assessment of grid-connected voltage source converters: A transient energy functions perspective," *IEEE Access*, vol. 12, pp. 133 545–133 556, 2024. DOI: 10.1109/ACCESS.2024.3450316
3. A. Poulose and S. Kim, "Transient stability analysis and enhancement techniques of renewable-rich power grids (review article)," *Energies*, vol. 16, no. 5, 2023, ISSN: 1996-1073. DOI: 10.3390/en16052495
4. A. Poulose and S. Kim, "Synchronizing torque-based transient stability index of a multimachine interconnected power system," *Energies*, vol. 15, no. 9, 2022, ISSN: 1996-1073. DOI: 10.3390/en15093432

Conference Proceedings

1. A. Poulose and S. Kim, "A technical briefing on machine learning for transient stability assessment in power systems," in *2025 International Conference on Advanced Information Technology (ADINTECH)*, Phnom Penh, Cambodia, 2025. URL: https://www.dbpia.co.kr/Journal/articleDetail?nodeId=NODE12333641
2. A. Poulose and R. Kumar P., "Performance analysis of load frequency control for a two-area interconnected power system using twisting control," in *2019 International Conference on Intelligent Computing and Control Systems (ICICCS)*, Madurai, India, 2019. URL: https://sites.google.com/view/albertpoulose/publications?authuser=0
3. A. Poulose and R. Kumar P., "Super-twisting algorithm based load frequency control of a two-area interconnected power system," in *2019 20th International Conference on Intelligent System Application to Power Systems (ISAP)*, New Delhi, India, 2019, pp. 1–5. DOI: 10.1109/ISAP48318.2019.9065992

Research projects and agenda

2025.03 to Present — **Postdoctoral agenda (led by Albert Poulose)**
Physics-informed TSA/CCT surrogates; multimachine extensions; inertia/damping estimation; GFM/GFL dynamic-security themes. Aimed at IEEE Transactions-quality outputs and reusable simulation/ML workflows.

2020.03 to 2025.02 — **Ph.D. research**: Supervisor: Prof. Soobae Kim, KNU
Synchronizing-torque indices for multimachine TSA; Lyapunov/TEF methods for renewable-connected VSCs. Established the analytical core now being extended with scientific ML.

Near-term targets: Multimachine PINN/TSA submission; parameter-estimation study; converter-dominated physics-informed surrogate; open research software; expanded collaborations beyond the Ph.D. laboratory.

Skills

Research expertise

- **Power system dynamics and stability**: Transient, small-signal, and frequency stability, dynamic security assessment, contingency analysis, renewable integration, converter-dominated systems (GFM/GFL converters, VSM, PLL dynamics, droop control, weak-grid stability), learning-assisted and physics-informed analysis, multimachine modeling, load frequency control, trajectory prediction, inertia and damping estimation.
- **Modeling & computational tools**: MATLAB/Simulink, PSCAD, PSS/E, PowerWorld, PSAT, PST, ANDES; Python for scientific computing and data-driven analysis.
- **Machine learning**: PyTorch, scikit-learn, NumPy/SciPy for PINNs and ML-based transient-stability surrogate models.
- **Analytical & control methods**: Lyapunov and energy-function methods, nonlinear control, dynamic modeling.
- **Research leadership trajectory**: First-author journal program from classical TSA to converter TEF to PINN surrogates; postdoctoral agenda aimed at Transactions venues, open tools, and external collaborations.
- **Teaching**: Peer-reviewed dissemination; university teaching (course delivery, assessment, mentoring); collaborative research.
- **Scholarly communication**: LaTeX for publications and instructional materials.

Languages

- English (professional), Malayalam (native), Korean (intermediate)

Achievements

2020.03 — **KNU International Graduate Scholarships (KINGS)**: Tuition support for Ph.D. coursework at Kyungpook National University, South Korea.

2016.03 — **GATE (India)**: Qualified at the 90.90th percentile; national graduate scholarship for M.Tech. studies.

References

Ph. D Supervisor

Dr. Soobae Kim , Professor
Kyungpook National University
School of Electronic and Electrical Engineering, Buk-gu, Daegu-41566, South Korea
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M.Tech Supervisor

Dr. Ramesh Kumar P. , Associate Professor
APJ Abdul Kalam Technological University
Government Engineering College, Kozhikode, Kerala, India (*current affiliation*)
M.Tech supervisor while at *Government Engineering College, Thrissur*; correspondent subsequently moved to Kozhikode.
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