Dr. Sathyanarayan Rao

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Compute Stories — Research Software Engineer
Phenorob Project — Forschungszentrum Jülich, Germany

Profile

Scientific Programmer & Software Developer with expertise in computational simulations, data analytics, and agricultural modeling. Kaggle Hobbyist with Master rank and a programmer with extensive experience in high-performance computing and model coupling. Creator of educational content on computational topics through YouTube channel "Compute Stories".

Education

- **PhD in Engineering Sciences**, UCLouvain, Belgium 2016 – 2020
  Thesis: Computational Modeling of Electrical Signatures of Plant Roots
  Advisor: Prof. Mathieu Javaux
- **MS in Optical Physics**, Alabama A&M University, USA 2013 – 2014
  GPA: 4.0/4.0
- **MS in Electrical Engineering**, University of Alabama in Huntsville, USA 2010 – 2012
  GPA: 3.9/4.0
  Thesis Advisor: Prof. Nagendra Singh
- **B.Eng in Electronics and Communication**, VTU, India 2006 – 2010
  First Class with Distinction

Professional Experience

- **Scientific Software Engineer**, Phenorob Project, Forschungszentrum Jülich 2023 – Present
  - Developed coupling mechanisms for crop models in Fortran, C++, and Python
  - Created and maintained phenorobdaa.de using Hugo
  - Produced educational content through YouTube tutorials on crop modeling tools
  - Led monthly project meetings and contributed to book chapters
- **Research Associate**, Indian Institute of Science, Bengaluru 2022 – 2023
  - Developed ML models for soil moisture estimation using LSTM networks
  - Created popular Kaggle notebooks with over 1000 views
  - Led field experiments and trained researchers in data collection
- **Visiting Researcher**, University of Bonn, Germany 2017 – 2019
  - Conducted computational analysis of plant root electrical signatures
  - Collaborated on finite element modeling with Prof. Andreas Kemna

Technical Skills

- **Programming Languages:** Python, C++, Fortran, MATLAB, JavaScript
- **Scientific Computing:** High Performance Computing, Model Coupling, Data Analytics
- **AI/ML:** TensorFlow, PyTorch, scikit-learn, LSTM, Neural Networks
- **Web Development:** Hugo, HTML, CSS, Tailwind CSS, Jekyll
- **Development Tools:** Git, CI/CD Pipeline, GitHub Actions, Jira

Achievements

- **Kaggle Master:** Ranked 649 of 322,985 users, 10 Silver & 10 Bronze Medals
- **MATLAB Excellence:** Ranked 164 of 19,325, 70,339 Downloads, 4.40 Rating
- **YouTube Channel:** Creator of "Compute Stories", teaching computational topics

Publications

Journal Articles

1. "Imaging plant responses to water deficit using electrical resistivity tomography", *Plant & Soil*, 2020
2. "Sensing the electrical properties of roots: A review", *Vadose Zone Journal*, 2020
3. "Geo-electrical methods for root signatures", PhD thesis, *UCL-Université Catholique de Louvain*, 2020
4. "Impact of maize roots on soil–root electrical conductivity", *Vadose Zone Journal*, 2019
5. "Waves in helicon magnetic nozzle plasma", *Physics of Plasma*, 2013
6. "Current-free double layers in a helicon device", *Physics of Plasma*, 2012
7. "Plasma turbulence from shear Alfvén waves", *Physics of Plasma*, 2012

Book Chapters

1. "Digital Agricultural Avatar: Integrative Crop Modeling for Agricultural Resilience and Climate Change Adaptation", *Springer*, In Preparation
2. "Can Language Models Revolutionize Climate Smart Agriculture? Navigating Applications, Challenges, and Strategic Approaches", *Springer*, In Preparation

Conference Presentations

1. "Soil Moisture Workshop, Random Forest for Soil Moisture retrieval", IIT Bombay, 2023
2. "MALM forward modeling with root structure", Geophysical Research Abstracts, 2019
3. "Electrical anisotropy as root phenotyping, numerical study", Geophysical Research Abstracts, 2019
4. "Electrical anisotropy and root system architecture", National Symposium for Applied Biological Sciences, 2019

5. "Characterization of root electrical properties", 5th International Workshop on Induced Polarization, 2018
6. "Electrical signature of root systems", AGU Fall Meeting Abstracts, 2018
7. "Electrical Properties of Soil-Root Continuum", AGU Fall Meeting Abstracts, 2018
8. "Anisotropy in induced polarization of maize root–soil", International Conference on Terrestrial Systems Research, 2018
9. "Electrical conduction model in soil-root continuum", 4th International Workshop on Geoelectrical Monitoring, 2017
10. "Electrical resistivity Tomography for root systems", EGU General Assembly Conference Abstracts, 2017

Fellowships & Grants

FNRS Fellowship (2016-2020), NSF Fellowship (2011-2012), DFG Grant TVL-E13 (2015-2016), NASA Funded Project (2011-2012)