


# Dr. Sathyanarayan Rao

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

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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

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- **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

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- **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

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- **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

## Activities

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

## Publications

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### 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

## Professional Service

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- **Peer Review Activities:**

- Reviewer for PeerJ
- Reviewer for Plant and Soil
- Reviewer for Vadose Zone Journal
- Grant proposal reviewer

Total: 4 reviews across journals and grant proposals

## Fellowships & Grants

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- **Research Fellowships:**

- FNRS Fellowship 2016 – 2020
- NSF Fellowship 2011 – 2012
- KAUST Postdoctoral Fellowship (\$60,000, Offered but not accepted) 2022
- Hebrew University Postdoctoral Fellowship (Offered but not accepted) 2022

- **Research Grants:**

- DFG Grant TVL-E13 2015 – 2016
- NASA Funded Project 2011 – 2012