Divya Karade

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Education

Ph.D. in Biological Science (Chemoinformatics, Metabolomics and Computational Biology) *Jan 2015 - Thesis submitted*
Academy of Scientific and Innovative Research (AcSIR) *Pune, Maharashtra, India*

- Thesis**:** Chemoinformatics based investigation of plant metabolites for their medicinal and crop protection values

Master of Science (Plant Biotechnology) - Cumulative GPA: 8.14 /10.0 *Sep 2008 - Nov 2010*
A.N.G.R.A. University, Dept. of Biotechnology *Hyderabad, India*

- Thesis**:** Characterization of genetic variability in cowpea using morphological, biochemical and molecular markers.

Bachelor of Science (Agricultural Science) - Cumulative GPA: 7.68 /10.0 *Aug 2004 - Aug 2008*
Dr. P.D.K.V. University, College of Agriculture *Nagpur, Maharashtra, India*

- Relevant Coursework**:** Statistics, Maths, Plant Biotechnology, Plant Biochemistry, Molecular Biology, Genetics, Microbiology

Innovation Project

AIDrugApp: Artificial Intelligence-based Virtual Screening Web-App for Drug Discovery *Sep 2020 - Present*
https://sars-covid-app.herokuapp.com/ **(Python3 | TensorFlow | Keras | scikit-learn | Matplotlib | Streamlit | Heroku)**

- Innovated and founded a user-friendly web application platform called 'AIDrugApp' for drug discovery.
- Created and Implemented 8 DL algorithms to AIDrugApp for the virtual screening of inhibitor molecules against SARS-CoV-2.
- Originated and integrated machine learning tools like Auto-Multi-ML, Auto-DL, etc to AIDrugApp.

Experience

Senior Research Fellow (Ph.D. Candidate) *Jan 2017 - Present*
CSIR National Chemical Laboratory, Chemical Engineering and Process Development *Pune, India*

- Designed and executed laboratory biochemical experiments to optimize 4 Indian varieties of soybean samples for LC/MS studies.
- Conceptualized analyzing methods for mass spectrometric data (7185 mass features) using machine learning tools and techniques.
- Discovered and reported the presence of 14 novel small molecules in soybean through tandem mass spectrometry analysis.
- Generated virtual library of 815 novel drug-like molecules from soybean small molecules through chemoinformatics techniques.
- Investigated and designed 169 pesticide-like molecules from 162 plants using chemoinformatics tools and QSAR approaches.

Junior Research Fellow (Ph.D. Candidate) *Jan 2015 - Dec 2016*
CSIR National Chemical Laboratory, Chemical Engineering and Process Development *Pune, India*

- Researched molecular data (n=3459) by text mining 91206 PubMed literature related to 104 Indian medicinal plants.
- Developed 4 computational protocols for designing novel molecules from small molecules of medicinal plants & food crops.
- Analyzed molecular data with chemoinformatics tools and techniques and built a virtual library of 4147 novel drug-like molecules.

Patent Analyst, Life Science Division *Mar 2013 - Dec 2014*
CSIR Unit of Research & Development of Information Products *Pune, India*

- Examined current technology alerts and patent updates in the field of life sciences for 5 projects.
- Interpreted comparative and competitive patent portfolio after novelty, patentability and prior art search.
- Mapped data for constructing a technological patent landscape.

Reviewer for the "Journal of Experimental and Theoretical Artificial Intelligence" (Taylor & Francis) *Feb 2021- Present*

Skills

- **Programming Languages:** Python, R, MySQL, HTML
- **Data Science & Miscellaneous Technologies:** Biological and Chemical Data analysis, Data science pipeline (cleansing, wrangling, EDA, visualization, modeling, interpretation) Statistics, Hypothesis testing, Excel, GitHub
- **Big Data and Machine learning:** TensorFlow, Keras, scikit-learn, streamlit, NumPy, pandas, Matplotlib, seaborn, Building and deploying ML/ DL algorithms, Feature engineering, Auto-ML, Auto-DL, Web-app development, cloud platform – Heroku, AWS
- **Bioinformatics:** Molecular docking and analysis using computational chemistry tools like Schrodinger, MOE, AutoDock, etc.
- **Patinformatics:** Prior art search, Freedom to operate analysis, Landscaping, Novelty check
- **Chemoinformatics:** Drug designing, data/ text mining, Network analysis, Chemical structure analysis, QSAR, virtual screening, building virtual libraries, ADME, scaffold analysis using chemoinformatics tools like MOE, ChemAxon, ChemDraw, Cytoscape.
- **Genomics:** DNA and RNA extraction, PCR analysis, Phylogenetic statistical analysis
- **Proteomics:** Protein extraction from plant tissues, Electrophoresis techniques – PAGE
- **Metabolomics:** Untargeted metabolomics, Mass spectrometric data analysis, Univariate and Multivariate statistical analysis

Honors & Awards

National & International

- National-level AWS DeepRacer at Woman's league for community car races driven by reinforcement learning codes in python through AWS cloud-based 3D racing simulator. **(Selected in top 100)** *Apr 2021*
- National Award for "AIDrugApp" at the open-source "Drug Discovery Hackathon-2020" against Covid-19 in phase-1 under moonshot category organized by Govt. of India. **(Selected in top 10 out of 377 shortlisted applicants)** *Mar 2021*
- Certificate of Merit for "AIDrugApp" in student engineering model competition under "Digital India" theme held at "Indian International Science Festival" organized by Govt. of India. **(Selected in top 4 out of 31 finalists)** *Dec 2020*

Academic

- Awarded Senior Research Fellowship for continuing Ph.D., CSIR-UGC (National Eligibility Test) NET exam, India *2017*
- All India rank **90** for Junior Research Fellowship for Ph.D. admission in Life-Science, CSIR-UGC NET exam, India *2013*
- Awarded for Graduate Aptitude Test in Engineering (Biotechnology) for Ph.D. admission, MHRD, India *2011, 2012*
- All India rank **64** in National Eligibility for Lectureship in Life-Science, CSIR-UGC NET, India *2011*
- Awarded National Eligibility for Lectureship in Plant biotechnology by ASRB NET, India *2011*
- All India rank **31** in Plant Biotechnology common entrance exam for P.G. admission, JNU, India *2008*
- All India rank **14** in Plant Biotechnology entrance exam for P.G. admission, ICAR, India *2008*

Publications

Divya Karade, D. V., N. Kadoo, R. Vyas, P. K. Ingle and M. Karthikeyan. Design of Novel Drug-like Molecules using Informatics Rich Secondary Metabolites Analysis of Indian Medicinal and Aromatic Plants. *Combinatorial Chemistry & High Throughput Screening* **2020,** *23* (10), pp. 1113-1131. (Impact factor: 1.2, click here)

Divya Karade, Vikas Karade. AIDrugApp: Artificial Intelligence-based Web-App for Virtual Screening of Inhibitors against SARS-COV-2. *ChemRxiv. Preprint* **2020**. (Web-App: click here)

Divya Karade. AutoDL: Automated Deep Learning (Machine learning module of AIDrugApp - Artificial Intelligence Based Virtual Screening Web-App for Drug Discovery) (Version 1.0.0). *Zenodo*. **2021**. (Software: click here)

Divya Karade, S. Sivaramakrishnan, K. Venkateswaran, R.S. Reddy. Characterization of genetic variability among cowpea (Vigna Unguiculata L. Walp) germplasm using morphological, biochemical and molecular markers. *Jour. Of Med. Sci. & Tech*.2012, 1 (2), pp. 43-61. (click here)

Divya Karade, Vikas Karade. AIDrugApp: Artificial Intelligence-based Web-App for Virtual Screening of Inhibitors against SARS-COV-2. *Journal of Experimental and Theoretical Artificial Intelligence* **2021**. (Impact factor: 2.111, Under review)

Divya Karade, S. Mundhe, N. Kadoo, M. Ratnaparkhe, R. Vyas and M. Karthikeyan. Bridging In-Silico and Experimental: Chemoinformatics Analysis for Mass Spectrometry-Based Metabolomics Study of Soybean. *Metabolomics* **2021**. (Impact factor: 3.167, Under review)

Research Presentations

Posters

Divya Karade, N. Kadoo, M. Karthikeyan (**2019**) 'Antidiabetic Drug Designing Based on Organic Metabolites from Fenugreek: A Chemo-and Bioinformatics Approach' presented at an international symposium on "Accelerating Biology: Towards Thinking Machines" conducted by C-DAC, Pune.

Divya Karade, N. Kadoo, M. Karthikeyan (**2017**) 'Chemoinformatics Investigation of Organic Metabolites from Soybean Reveals Common Drug Scaffolds' presented at CSIR-National Chemical Laboratory, Pune on the "National Science Day".

Divya Karade, N. Kadoo, M. Karthikeyan (**2017**) 'Drug Design based on Metabolomics of Indian Medicinal and Aromatic Plants: A Chemoinformatics Approach' presented at CSIR-National Chemical Laboratory, Pune on the "National Science Day".

Workshop

Instructor (**10** people) and participated in "Chemoinformatics-2018" for skill development program by CSIR-NCL, Pune.