Sivaramakrishnan Subramanian

LinkedIn ○ Google Scholar ○ GitHub ○ E-mail

Research Interests

Signal Processing, Visual Perception, Representation Learning, Scalable Data Systems, Statistical Machine Learning

Education

Anna University, SSN CE **Aug '14 – May '18**

Bachelor of Electrical & Electronics Engineering (Hons.)

Cum. GPA: 8.28/10.0 (3.68/4.00 - top 10% of Graduating Class)

Relevant Courses: (*Grade Eqv. S: 10, A: 9, B: 8*)

- Linear Algebra & Differential Calculus (*MA6151*: S)
- Digital Signal Processing (*EE6403*: A)
- Comp. Programming (*CS6456*: B, *GE6161*: S, *GE6263*: S)
- Adv. Calculus (*MA6251*: S, *MA6351*: B, *MA6459*: S)
- Adv. Control Systems (*IC6501*: B, *IC6601*: A)

Zion Secondary School **Jun '12 – May '14**

Higher Secondary Course Certificate - CS concentration

Total Score: 1173/1200 (97.75% - top 1% of 800,000 students)

Relevant Electives:

- Comp. Science: 200/200
- Math: 197/200
- Physics: 199/200

Secondary School Cum. GPA: 10.0/10.0

Work & Research Experience

Listing Problem Description (**PD**), Contribution (**CO**), Impact/Outcome (**IO**) for select works. Detailed account here.

Lead Data Scientist, R&D Div. **AppOrchid Inc** **Oct '19 - Present**

- **PD:** *Document Representation Learning* - extracting legalese documents' layout & structural metadata
- **CO:** Created a custom *LayNet* model architecture with yolo_v4 backbone for this object detection task; pre-trained on 330,000 image PubLayNet dataset and fine-tuned for downstream task
- **IO:** Final model was more robust (0.73 mAP) and 8x more throughput than the caffe2 baseline (0.56 mAP)

- **PD:** *Semantic Document Understanding* - extracting data within tabular structures from financial documents
- **CO:** Designed a custom multi-head *TabNet* detection model with BiFPN fusion on cascade_mask_rcnn; pre-trained on ICDAR 2019 cTDaR task; performed model quantization to decrease latency
- **IO:** Achieved 0.48 AP & reduced latency by 3x. Both works received recognition from SVP & CTO

CV Project Engineer **Soliton Tech** **Jun '18 - Oct '19**

- **PD:** *Machine Vision* - detect & track particulate defects (air voids) in industrial glass rods
- **CO:** Developed an image processing pipeline using KLT Tracker & Delaunay Triangulation to meet real-time speed & compute (edge processing) constraints on images from GigE Vision cameras
- **IO:** Final algorithm was deployed in a $2,000,000 pilot system for Corning Inc.

- **PD:** *OCR/Text typography* - Perform sparse text detection on a sensory monitoring device's image display
- **CO:** Built a custom model with CRNN, CTC decoder & Stroke Width Transform for sparse OCR pipeline
- **IO:** Final solution with 0.781 CER metric outperformed Google VisionAPI (benchmark) by 23% on client dataset; deployed on Medtronic's BIS monitoring devices & Philips Healthcare

Select Publications

[1] **Geometrical Sensitivity Analysis Based on Design Optimization and Multiphysics Analysis of PM Assisted Synchronous Reluctance Motor**
Bulletin of the Polish Academy of Sciences: Technical Sciences 2019 (*JCR Impact Factor: 1.662, Acc. rate ~15%*)
Nagrajan V.S., Kamaraj V., Sivaramakrishnan S.

[2] **Sensitivity Analysis and Design Optimization of Synchronous Reluctance and Permanent Magnet Motors**
Springer: Artificial Intelligence and Evolutionary Computations in Engineering Systems 2021
Nagarajan V.S., Balaji M., Kamaraj V., Sivaramakrishnan S., Subash K.

[3] **Design and comprehensive analysis of Synchronous Reluctance motor for Automotive Applications**
Springer: Lecture Notes in Mechanical Engineering 2022 (*In Press*)
Nagarajan V.S., Rajini V., Harish Babu M., Akash P., Babu Venkatesh S., Sivaramakrishnan S.

Books & Affiliations

Electrical Machine Design, Pearson Education **Fall '17**
Prof. Rajini & Prof. Nagarajan, EE, SSN CE
Contributed to ~10% of the contents including theoretical proofs, statistical derivations in chapters 5-7 & the final chapter on CAD analysis. Acknowledged in accordance in preface. This book serves as a primer for EE undergrad students.

Electric Motor Drives, Pearson Education **Spring '18**
Prof. Rajini & Prof. Nagarajan, EE, SSN CE
Derived theoretical proofs, developed coding simulations for chapters 4-15. This book serves as a reference for advanced machine design targeted towards industrial application needs.

Teaching Assistant **Spring '18**
Prof. Nagarajan *EE6703: Special Electrical Machines*
Taught electric drive simulation using Finite Element analysis in MotorSolve and resolved doubts for a class of ~140 students. Helped in conducting bi-weekly lab practicals, grading and logistics.

Grants & Awards

Research Sponsorship, INR 21,18,000 **2017**
Dept. of Science & Technology, Govt. of India (*GoI*) *DST no: SERB IRR/2016/000015*
Undergraduate research was sponsored by Science and Engineering Research Board (SERB), GoI with my Dept. Chair as PI and thesis advisor as Co-PI. This funding directly led to research papers [1, 2] listed above.

Research Grant, INR 25,000 **2016**
SSN College of Engineering
Rewarded grant by SSN Trust through the Internal Funding scheme for *Comparison of the performance of PM Assisted Synchronous Motor with conventional motor drives* (6 out of 38 student app.)

- **Best paper award** for oral presentation of research paper at International Conference on Energy & Materials Tech (ICEMT). Accepted to Springer [3] by virtue of this **2021**
- Spot award: Employee of the Quarter (**EoQ**), AppOrchid Inc **2021**
- Spot award: **High Impact award**, Soliton Tech **2018, 2019**
- Awarded **Certificate of Distinction** for top 1 percentile ranks throughout Sr. Secondary **2014**
- Titled **CBSE Merit Scholar** in Secondary examinations for achieving 10 CGPA (4 out of 75) **2012**

Civic Engagements

Technical Mentor **May '20 - Jul '21**
Privacy Preserving ML (*PPML*), *OpenMined Inc.* *Science & Technology*
Mentored students and incoming researchers joining the OpenMined community on PySyft and PyGrid fundamentals & codebases - these are PPML tools that combine federated learning and differential privacy

Student Mentor **Dec '16 - Jun '17**
Teach-A-School (*TAS*), *Lakshya* *Community*
Mentored disadvantaged kids from (five) Government schools in the city suburbs on fundamental English, Math and Entrepreneurial skills. Designed *Artoons* project for 90 kids in the 2-8 age group

Technical Skills & Misc

- **Languages**: Python, C++, MATLAB, LabVIEW
- **Machine Learning Frameworks**: Tensorflow (1.1x, 2.2+), PyTorch(0.4, 1.2+), Caffe2, Chainer, JAX
- **Tools**: OpenCV, Neo4j, PostgreSQL, Docker, CUDA, Django, REST API microservices, AWS, Git, LaTeX
- Industry recommendations (aside from three academic LoRs)

Massive Open Online Courses
- Algorithms & Graphs Specialization (Stanford Lagunita, Coursera)
- Deep Reinforcement Learning CS285 (UC Berkeley)

Standardized Tests
- GRE: 331/340 (Q:170, V:161, AWA: 5.0)
- TOEFL iBT: 117/120