



## Ananta Narayanan Balaji

Ph.D. Candidate, National University of Singapore

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### Research Interests

Mobile/Wearable sensing, Wearable on-device AI architectures (FPGA/ASIC based ), Human Computer Interaction (Tangible and Embodied Interaction), AI for healthcare

### Education

#### National University of Singapore

January 2018- Present

Ph.D. candidate in Computer Engineering (Specialization in Signal Processing and Machine Intelligence)

Advisor: [Peh Li-Shiuan](#), Provost's Chair Professor, Dept. of Computer Science, NUS

#### National University of Singapore

Aug 2015 -May 2016

Masters of Science in Electrical Engineering (Specialization in Computer Engineering)

Thesis: Segmentation of Femoral head in 3D ultrasound images of infants

Thesis Advisor: [Prof. Ashraf Kassim](#), Dept. of ECE, NUS

#### Thiagarajar College of Engineering, Anna University (India)

Aug 2011 - May 2015

Bachelors of Engineering in Electronics and Communications Engineering

Cumulative Average Point: **9.9/10 (Top student in the Cohort)**

### Current Research

#### 1. pH Watch – Leveraging pulse oximeters for sensing pH from sweat (Mobisys'2019)

Advisors: Prof. Peh Li Shiuan, Dept. of computer Science and Prof. Shao Huilin, Dept. of Biomedical Engineering, NUS

- pH Watch is the first ever prototype for sweat pH (indicator of dehydration risk) sensing using pulse oximeters (Heart rate/ SpO2 sensors) found in existing fitness trackers. (Media Coverage: ACM TechNews, Straits times, NUS News, TechXplore, CNA news etc.)

#### 2. Fast, low-power Neural network compute Engine for wearable on-skin interfaces (Manuscript under review)

Advisor: Prof. Peh Li Shiuan, Dept. of computer Science

- Developed a interactive wearable on-skin interface integrated with Spike neural network based faster neural network hardware accelerator (realized using FPGA's or custom fabricated ASIC accelerators) that can be reconfigured across diverse neural network models (MLP's, CNN's and ResNets) for applications in virtual reality, robotics and health monitoring.

#### 3. Deep Neural Networks training and inference in ARM based Mobile GPUs (on-going)

Advisor: Prof. Bingsheng He, Dept. of computer Science

- Identified neural network layer bottlenecks as well as parameters that influence the Mobile GPU execution times.
- Introduced a semi-automated framework with kernel optimization parameters to run faster and low power neural network inference on mobile GPU's.

#### 4. Enabling smart watch sensors for continuous, non-invasive sensing of cortisol from sweat aiding in accurate stress management (on-going)

Advisors: Prof. Peh Li Shiuan, Dept. of computer Science and Prof. Shao Huilin, Dept. of Biomedical Engineering, NUS

### Publications

- [Ananta B](#), Chen Y, Bo W, Shao H and LS Peh, "pH Watch - Leveraging pulse oximeters in existing wearables for reusable, real-time monitoring of pH in sweat", Proceedings of the 17th Annual International Conference on Mobile Systems, Applications, and Services. ACM [Mobisys](#), 2019 (Acceptance Rate = 39/172 ~ 22%)
- [Ananta B](#), Chen Y, Bo W, Shao H and LS Peh, "Demo: pH Watch - Leveraging pulse oximeters in existing wearables for reusable, real-time monitoring of pH in sweat", Proceedings of the 17th Annual International Conference on Mobile Systems, Applications, and Services. ACM [Mobisys](#), 2019
- [Ananta Narayanan](#), "A Novel Image Processing Approach for Heart Beat Counting of *Daphnia Pulex*", International Conference on Communication, Computing and Networking Technologies (ICCCNT), IEEE, 2013

### Work Experience

#### Works Applications, Singapore (Also known as [AI Works](#))

Oct 2016 – Dec 2017

R&D Engineer, Advance Technology and Engineering (ATE) - Artificial Intelligence Division.

- Worked on Automatic Form filling from PDF's for payment invoices and Flight tickets.

- Involved in implementing Fast-CNN based Document layout analysis and RNN based architectures for learning semantic and Logical structure of PDF documents.
- Involved in Implementing Automatic Table detection algorithms based on RNN and LSTM.
- Also Worked on backend and UI/UX development.

## Internships

### Ph.D. Intern @ Google Daydream – Augmented Perception Interaction team

Hosts: Dr. David Kim, Research Scientist & Manager and Dr. Ruofei Du, Research Scientist

Mar 2020 – Jun 2020

- Low-power, Low-compute and user-friendly passive stylus based interaction input methods for future Augmented reality devices
- Formulated a low-compute depth estimation technique for low-power controller tracking for future AR glasses.
- Developed a low-power stereo camera based glass prototypes to achieve 3dof controller tracking.
- Language and Tools: Python, OpenCV, Open3D, OpenGL

Jan 2019 - Jun 2019

### Portcast Pte Ltd (EF Startup Funded by SGInnovate)

Deep tech Intern (SG Innovate – Summation programme)

- Involved in developing and deploying Deep learning models (RNN, LSTM with attention, CNN etc.) in AWS for demand prediction and shipment route prediction.
- Also Involved in Developing models for analysing different marine carriers based on their performance metrics and helped marine forwarders choose carriers which perform best for a particular route.

April 2016 – July 2016

### Temasek Laboratories @ NUS

Research Intern in Intelligent Unmanned Aerial Vehicles Lab

Supervisor: Dr. Garrick Orchard (Now Senior Neuromorphic Algorithms Researcher at Neuromorphic computing Labs @ Intel)

Project: Quadcopter/UAV tracking using [ATIS Neuromorphic camera](#)

- Worked on various Noise Filtering algorithms/strategies in images obtained through ATIS/Neuromorphic cameras.
- Involved in implementing Siamese architecture based CNN networks for quadcopter tracking in the videos taken with ATIS Cameras

### Panasonic R&D Centre, Singapore (PRDCSG)

Dec 2015 – Mar 2016

R&D Intern in AI Solutions Development Team

Supervisor: WEI Zheng (Currently R&D Director at Deep North Inc., China)

Project 1: Sentence Classification for Chatbots

- Involved in Implementing CNN architectures for Sentence classification in chatbots.
- Also, improved sentence classification using RNN's and also with Bidirectional LSTM.

Project 2: Visual Sentiment Analysis

- Involved in developing an effective CNN architecture for visual sentiment analysis

### TCS Innovation Labs (CTO Unit), Chennai, India

Research Intern at NLP Lab

Jan 2015 – May 2015

Project: Natural Language based Question Answering System

- Involved in developing a Question answering framework called NATAS using a Semantic Web based ontology of the domain to aid in the retrieval of relevant data and concepts from the business application.

## Technical Skills

Machine Learning and Deep Learning Libraries	TensorFlow, scikit-learn, keras, pytorch
Natural Language Processing Libraries	Word2Vec, stanfordNLP, NLTK
Programming Languages and Databases	C/C++, Java, MySQL Python, MySQL, PostgreSQL, Cassandra
Web App Development Skills / Cloud Skills	Spring, Flask, Docker, Kubernetes, Amazon EC2
Embedded/Firmware Development	Embedded C, Verilog/SystemVerilog, VHDL IDE's – Xilinx SDK, CCS, Synopsys compiler(for ASIC design)
Computer Vision Libraries	OpenCV, VTK – Python, Matlab

## Web URL

 <https://www.linkedin.com/in/anantabalaji/>  <https://www.kaggle.com/anantab>  <https://github.com/AnantaBalaji/>

## **Awards and Scholarships**

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<i>NUS Research Scholarship Award</i>	2018 - 2022
<i>Best Outgoing Student – Medal of Excellence – Thiagarajar College of Engineering</i>	March 2015
<i>Academic Proficiency Award – Thiagarajar College of Engineering</i>	2012- 2015

## **Teaching Assistanship**

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<i>CG3207 – Computer Architecture</i>	AY 2018/2019 SEM 1
<i>CG2028 – Computer Organization</i>	AY 2018/2019 SEM 1,2
<i>EE2028 – Microcontroller Programming and Interfacing</i>	AY 2018/2019 SEM 2
<i>CG4002 – Computer Engineering Capstone Project</i>	AY 2019/2020, 2020/2021

## **Academic Services and Past Student Activities**

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Reviewer for IMWUT 2020, CHI 2021

Program Chair in NUS CS Research Week 2020

Placement Representative, Thiagarajar College of Engineering	2014-2015
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Assistant Joint Secretary, IEEE Students chapter, Thiagarajar College of Engineering	2012-2013
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## **Hobbies**

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I enjoy listening to music, as well as playing video games with friends.

## **References**

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Available upon request