Jun-geun Park

CONTACT INFORMATION

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INTERESTS

The design and implementation of systems and algorithms to perform location, activity, and context inference for mobile devices, sensor platforms, and robots in indoor/outdoor environments. Context-aware information processing of mobile sensor data. Machine learning, signal processing, statistical inference, time-series analysis, data processing and visualization of large-scale, high-dimensional, high-velocity data.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA, USA

Ph.D. / S.M. in Aeronautics and Astronautics Feb. 2006 – Jun. 2013

- PhD Thesis: "Indoor Localization using Place and Motion Signatures", MIT, May 2013
- SM Thesis: "Moving-Baseline Localization for Mobile Wireless Sensor Networks", MIT, Feb. 2009
- Advisor: Prof. Seth Teller, GPA: 4.9/5.0

Seoul National University, Seoul, Republic of Korea

B.S. in Mechanical and Aerospace Engineering Mar. 2000 – Feb. 2004

- GPA: 4.06/4.3. Ranked 1st in the Aerospace Engineering Option

EXPERIENCE

Cambridge Mobile Telematics, Inc, Cambridge, MA, USA
Senior Software Engineer / Data Scientist May. 2013 – present

Smartphone-based mobile data analytics for improving driving safety (I implemented all of the following work into the production environment):

- Designed and implemented an automatic **transportation mode classifier**, which distinguishes various transportation modes including car, bike, foot, airplane, train, ferry, motorcycle, etc., using predictive machine learning models.
- Designed and implemented a machine-learning-based **passenger classifier**, which distinguishes car trips by the driver from trips taken as a passenger.
- Developed a **classifier training architecture** for large scale trip data, using *Apache Spark*.
- Designed and implemented an **on-phone drive detector for Android** platform.
- Designed and implemented the main components of **data processing pipeline** that takes sensor, map, timing data as input and computes trip events and scores as output.
- Improved an **orientation algorithm** that aligns arbitrarily positioned phone orientation into the car frame.
- Designed and implemented **driving safety scoring** algorithm. Implemeted several different driving safety scoring codes per client specifications.
- Performed various **on-demand analyses** on driver detection performance, battery consumption, and backend performance metrics, and fixed numerous problems on my own initiative.

Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA, USA
Research Assistant Sep. 2008 – May. 2013

Conducting research on location/activity inference algorithms and methods for context-aware computing in indoor environments (in collaboration with *Nokia Research Center*):

- Designed a novel **activity-based location inference algorithm** on mobile phones using probabilistic graphical models, which utilizes high-level user motion context and map constraints to find user trajectories.
- Developed a **state-of-the-art motion classifier** using smartphone sensors.
- Implemented **pipelines and tools to collect, process and visualize** data, using C++/Scala/Matlab/Python.
- Developed a **crowdsourced WiFi-based location discovery system** for indoor environments. Designed and implemented a statistical positioning algorithm and architecture using crowdsourced WiFi signals, demonstrating feasibility of "organic" location systems.
- Deployed the **indoor positioning system for patient care** application in *The Boston Home*, a health-care facility for patients with progressive neurological diseases.

Qualcomm Research, Qualcomm Incorporated, San Diego, CA, USA
Research Intern Jun. 2012 – Aug. 2012

Worked on the *Places* algorithm, which **automatically discovers places of relevance** from GPS and WiFi signals sensed by a user's mobile device:

- Proposed, implemented, and tested algorithmic solutions to adapt the system to noisy and changing environments. The proposals significantly increased performance under various application scenarios.
- The proposed improvements were reviewed for inclusion in Qualcomm context-awareness SDK.

Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA, USA
Research Assistant Sep. 2006 – Aug. 2008

Developed a novel **localization algorithm for moving sensor networks**:

- Designed a distributed, collaborative, moving-based localization algorithm for mobile sensor networks.
- Evaluated the algorithm both in simulation and on real ultra-wideband (UWB) sensor platform data.

Flight Dynamics and Control Laboratory, SNU, Seoul, Republic of Korea
Undergraduate Research Assistant Mar. 2003 – Dec. 2003

Performed design and simulation of an **automatic guidance and control system for UAVs**.

- Designed a control system verticals, including LQR optimal guidance algorithm and PID attitude controller.
- Verified the designed system on a real UAV, winning the silver prize in the 2nd Korea Robot Aircraft Competition.

Samsung Electronics, Suwon, Republic of Korea
Intern Jun. 2002 – Aug. 2002, Dec. 2002 – Jan. 2003

Computational and experimental **fluid dynamic analysis** of a newly developed air conditioner

Refereed Publications

[1] **Jun-geun Park**, Ami Patel, Dorothy Curtis, Jonathan Ledlie, Seth Teller, "Online Walking Speed Estimation and Device Pose Classification using Handheld Devices", *Proc. 14th ACM International Conference on Ubiquitous Computing (UbiComp)*, pp.113-122, 2012

[2] Jonathan Ledlie, **Jun-geun Park**, Dorothy Curtis, André Cavalcante, Leonardo Camara, Afonso Costa, Robson Vieira, "Molé: a Scalable, User-Generated WiFi Positioning Engine", *Journal of Location Based Services (JLBS)*, Vol. 6, No. 2, 2012

[3] Finale Doshi, William Li, Yoni Battat, Ben Charrow, Dorothy Curtis, **Jun-geun Park**, Sachithra Hemachandra, Javier Velez, Bryan Reimer, Seth Teller, Nicholas Roy, "Improving Safety and Operational Efficiency in Residential Care Settings with WiFi-based Localization", *Journal of American Medical Directors Association (JAMDA)*, Vol. 13, No. 6, pp.558-563, 2012

[4] Jonathan Ledlie, **Jun-geun Park**, Dorothy Curtis, André Cavalcante, Leonardo Camara, Afonso Costa, Robson Vieira, "Molé: a Scalable, User-Generated WiFi Positioning Engine", *Proc. International Conference on Indoor Positioning and Indoor Navigation (IPIN)*, 2011 (**Best Paper Award**)

[5] **Jun-geun Park**, Dorothy Curtis, Seth Teller, Jonathan Ledlie, "Implications of Device Diversity for Organic Localization", *Proc. 30th IEEE International Conference on Computer Communications (INFOCOM)*, 2011

[6] **Jun-geun Park**, Ben Charrow, Jonathan Battat, Dorothy Curtis, Einat Minkov, Jamey Hicks, Seth Teller, Jonathan Ledlie, "Growing an Organic Indoor Location System", *Proc. 8th International Conference on Mobile Systems, Applications, and Services (MobiSys)*, pp.271-284, 2010

[7] **Jun-geun Park**, Erik Demaine, Seth Teller, "Moving-Baseline Localization", *Proc. 7th International Conference on Information Processing in Sensor Networks (IPSN)*, pp.15-26, 2008

Other Publications and Invited Talks

[1] **Jun-geun Park** and Seth Teller, "Motion Compatibility for Indoor Localization", MIT CSAIL Technical Reports, MIT-CSAIL-TR-2014-017, 2014

[2] **Jun-geun Park**, Erik Demaine, Seth Teller, "Moving-Baseline Localization", *Dagstuhl Seminar 07151 — Geometry in Sensor Networks*, 2007 (*Workshop Abstract*)

[3] **Invited Talks**, UbiComp 2012, Qualcoom Research 2012, INFOCOM 2011, MobiSys 2010, Nokia Research Center Palo Alto 2010, IPSN 2008, Dagstuhl Semninar 2007

Patents

[1] "Methods, Apparatuses and Computer Program Products for Providing a Private and Efficient Geolocation System" (US 8,594,680)

[2] "Methods, Apparatuses, and Computer Program Products for Determining Speed of Movement of a Device and Device Pose Classification" (US 9,069,003)

[3] "Method and Apparatus for Constructing a User-Generated Geographical System" (US 9,198,154)

Teaching and Mentoring Experience

[1] **Intern Advisor**, Cambridge Mobile Telematics **2016**
- Development of a simulator for the company's dynamic workload scaling system for AWS ("instance control"), and analysis of scaling algorithms using the simulator.

[2] **Student Research Advisor**, MIT CSAIL, Advised MIT students for the following projects: **2009-2012**
- Analysis and algorithmic development of the speed and phone pose estimation problem from inertial sensors using machine learning methods.
- Implementation of transfer-mode classification system using smartphone sensors.
- Exploratory analysis of 802.11 wireless signal data using unsupervised machine learning methods.
- Development of monitoring & visualization software for indoor positioning system.

[3] **Teaching Assistant**, MIT 16.35 Real-Time Systems and Software **Fall 2011**
Guided and graded programming assignments. Helped students grasp basic concepts and good practices in real-time computing (concurrent programming, real-time scheduling, interprocess communication, and requirements and verification of mission-critical systems) with real-time Java.

Honors and Awards

Best Paper Award, International Conference on Indoor Positioning and Indoor Navigation (IPIN) **2011**
Scholarship, Kwanjeong Scholarship Foundation **2006 – 2009**
Graduation with Highest Honor (*Summa Cum Laude*), Seoul National University **2004**
Scholarship for Academic Excellence, Seoul National University **2000 – 2003**
Scholarship, Chonnam Scholarship Foundation **2000 – 2001**

Activities and Services

- **External Reviewer**, IEEE MILCOM 2008, IEEE TSP 2010, ACM CIKM 2010, ACM TOSN 2010, IEEE ICCCT 2011, IEEE SMC-C 2011, ETRI Journal 2012, ACM UbiComp 2013, IEEE CAMSAP 2013, IEEE-TMC 2014, IEEE JSAC 2014, IEEE TMC 2015
- *Military Service*, Internet Fraud Monitoring Agent, Internet Crime Investigation Center, Supreme Prosecutors Office, Republic of Korea **2004 – 2006**

Technical Skills

- **Computer Language** Python, Scala, Matlab, Java, C++, C, Unix shell scripts, CoffeeScript (basic)
- **Scientific Computing**
  - *Data Analysis* Python stack (Numpy, Scipy, Pandas, Scikit-learn, etc.), Matlab
  - *"Big Data"* Apache Spark, Redis, Amazon Web Services (EC2, Kinesis, etc.), Streaming analytics, Time-series database (InfluxDB)
  - *Visualization* Python-based (matplotlib, seaborn, bokeh, etc.), Javascript-based (D3.js, DC.js, dygraphs, etc.), Matlab, R (ggplot2)
- **Software Engineering**
  - *GUI Frameworks* Qt (with C++ / Python)
  - *Mobile* Android, Maemo, Symbian
  - *Backend* Python, Database (PostgreSQL), Amazon Web Services
  - *Real-time Software* Real-Time Java
- **Tools** Version control (SVN, hg, git), Documentation (LaTeX, Markdown, etc.), Task automation