

LIANGCHUN XU

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EDUCATION

Tufts University, Medford, MA

Ph.D., Mechanical Engineering

GPA: 3.72/4.0

May 2020

Advisor: Jason Rife

Concentration: Guidance, **Navigation, Control**, Robotics, Automated Systems

Dissertation Title: Modeling Multipath Effects on FLL-derived Doppler Observables for Urban Navigation

Awards: **Student Paper Award** (ION GNSS+ 2017), **Best Session Paper Award** (ION GNSS+ 2015)

Wuhan University, Wuhan, China

M.Eng., Geomatics Engineering

Jun 2014

Awards & Honors: Exceptional Graduate of the Department of Geodesy and Geomatics Engineering (Jun 2014);

Yongling Chen Fellowship (Sep 2013)

B.Eng., Geodesy and Geomatics Engineering

Jun 2012

Awards & Honors: Exceptional Undergraduate of Wuhan University (Jun 2012); National Endeavor

Fellowship (Sep 2010); Excellent Students' Scholarship (three times, Sep 2009 - Sep 2011)

Huazhong University of Science and Technology, Wuhan, China

B.Eng., Computer Science (Double Major)

Jun 2012

EXPERIENCE

Apple Inc., Sunnyvale, CA

GNSS Systems Engineer (C/C++, Matlab, Python)

Sep 2023 - Present

- GNSS system algorithm design for cellular SOC

Samsung Electronics America, San Jose, CA

Senior Software Engineer (C/C++, Matlab, Python)

Mar 2021 - Sep 2023

- Supported SOC Location Software development and update for more than 500M mobile devices
- Developed high-rate MEMS IMU tightly coupling algorithms aided by GNSS for smart phones in driving scenarios, including nonholonomic constraints and zero PVA updates during static period
- Worked on RTK/PPP for smartphone applications
- Sensitivity improvement of smart phones via integration time tuning
- L5 signal adoption for smart wearables

Tufts University, Medford, MA

Research Assistant and Postdoctoral Scholar (C/C++, Matlab, Python, ROS)

Sep 2015 - Mar 2021

- Modeled multipath effects on frequency tracking loops (FLLs) and FLL-derived Doppler measurements in GPS for the first time; proposed a novel multipath detector using Doppler measurements
- Implemented a flexible extended Kalman filter (EKF) algorithm to process inertial and GPS measurements recorded in ROS and estimated the vehicle's position and velocity, assessed the performance, and developed integrity bounds to robustly and accurately infer autonomous vehicle's location
- Employed direct collocation method and sequential quadratic programming (SQP) with hard constraints to design a collision avoidance system for automatic parallel parking
- Simulated automatic lane keeping system which integrates an EKF to estimate vehicle dynamics and a LQR controller to steer the vehicle
- Built numerical optimizers using interior point method (IPM) and Newton's method

- Investigated machine learning algorithms for bug detection in ardupilot software and made a poster on NSF Cyber-Physical Systems (CPS) PI meeting 2019; implemented naive Bayes classifier, k-means algorithm, neural networks using Python in machine learning class

Insight Data Science, Boston, MA

Data Engineering Fellow (AWS, Python)

Jan 2020 - Apr 2020

- Built a data pipeline to analyze GDELT data to trace the most reported news events and the writers behind them; visualized the ranking results and the events' geolocation information using Plotly Dash
- Optimized the pipeline with cloud computing using AWS EC2, S3 and Spark, stored the data in PostgreSQL

GNSS Research Center of Wuhan University, Wuhan, China

Project Leader in Software Development (C/C++, CUDA)

Jul 2013 - Aug 2015

- Constructed a GPU based real-time GNSS software receiver with graphical user interface (GUI) in C, CUDA and Qt, which later became the testbed of the neighboring BeiDou System (BDS) RF frontend group, and a habitat for new GNSS-related algorithms developed by graduate students
- Implemented position, velocity, time (PVT) software for GPS/BDS dual-frequency (L1/L2) receivers, including both least square and Kalman filter estimations

Team Programmer (C/C++, Assembly)

Nov 2011 - Jun 2013

- Built a real-time GPS software receiver with SIMD instructions and multi-threaded programming
- Collaborated with a multidisciplinary team of electrical engineers, and software engineers in the development of FFT and filter algorithms to acquire and track GPS signal

AWARDS

Student Paper Award, ION GNSS+ 2017 (6 recipients globally)

Sep 2017

Best Session Paper Award, ION GNSS+ 2015

Sep 2015

Outstanding Youth Paper, CSNC 2013

May 2013

PUBLICATIONS

Capuano, Vincenzo, **Xu, Liangchun**, Benvides, Jose. "Smartphone MEMS Accelerometer and Gyroscope Measurement Errors: Laboratory Testing and Analysis of the Effects on Positioning Performance." *Sensors* 23.17 (2023): 7609. Sep 2023

Xu, Liangchun, Rife, Jason. "Modeling Multipath Effects on Frequency Locked Loops." *ION ITM 2020, San Diego, California, January 21-24, 2020.* Jan 2020

Xu, Liangchun, Rife, Jason. "NLOS and Multipath Detection using Doppler Shift Measurements." *ION GNSS+ 2019, Miami, Florida, September 2019.* Sep 2019

Xu, Liangchun, Rife, Jason. "Doppler-aided Line-of-sight Identification and Localization in Future Cellular Networks." *ION GNSS+ 2018, Miami, Florida, September 2018.* Sep 2018

Xu, Liangchun. "A Compact, Lightweight Sensor to Measure Bearing Angle to a Radio Transmitter." *ION GNSS+ 2017, Portland, Oregon, September 2017.*

- Awarded "Student Paper Award"

Sep 2017

Xu, Liangchun, Ziedan, Nesreen I., Niu, Xiaojie, Guo, Wenfei. "Correlation acceleration in GNSS software receivers using a CUDA-enabled GPU." *GPS Solutions*. Springer Berlin Heidelberg, 2016. Feb 2016

Xu, Liangchun, Ziedan, Nesreen I., Guo, Wenfei, Niu, Xiaoji. "NAVSDR: A GPU-based Modular GPS Software Receiver." *ION GNSS+ 2015, Tampa, Florida, September 2015*.

- Awarded "Best Session Paper" Sep 2015

Xu, Liangchun, et al. "A New SIMD Correlator Algorithm for GNSS Software Receivers to Process Complex IF Data." *China Satellite Navigation Conference (CSNC) 2013 Proceedings*. Springer Berlin Heidelberg, 2013.

- Awarded "Outstanding Youth Paper" May 2013

Yan, Kunlun, Zhang, Hongping, Zhang, Tisheng, **Xu, Liangchun**, Niu, Xiaoji. "Analysis and verification to the effects of NH code for beidou signal acquisition and tracking." *ION GNSS+ 2013, Nashville, Tennessee, September 2013*. Sep 2013

PROFESSIONAL SERVICES

NAVIGATION: Journal of the Institute of Navigation Reviewer Jul 2018

IEEE Transactions on Aerospace and Electronic Systems Reviewer Jan 2021

SIAM Undergraduate Research Online (SIURO) Reviewer Oct 2022

SKILLS

Programming:	C/C++, Matlab, Python, Mathematica, Qt, CUDA, Intel AVX
Software Development Tools:	Jira, Gerrit, Jenkins, AWS, Spark, PostgreSQL, Dash
Packages and Environments:	ROS, Git, Jupyter, Matplotlib, Ubuntu, MacOS
Algorithms:	Kalman filter, SQP, IPM, MPC, trajectory optimization, motion planning