Jinyu Xie *(Available in Sept. 2016)*

Last update on June 7, 2016

xjygr08@gmail.com • jxx123@psu.edu • +1 814-777-5960 • sites.psu.edu/jinyuxie
323 Leonhard Building • University Park • PA 16802 • United States

Summary

Jinyu's research interest has been focused on: (1) **Dynamic System Modeling and System Identification** (Data-driven modeling, Time Series Analysis); (2) **Control Theories** (Optimal Control, Predictive Control); (3) **Signal Processing** (State/Parameter Estimation, Fault/Maneuver Detection).

Passionate about intelligent systems aiming at creating better world with multiple projects:
(1) Research Project: Autonomous Insulin Delivery System (Artificial Pancreas) for Type 1 Diabetes Treatment;
(2) Intern Project: Pipeline Oil Leak Monitoring and Detection System, Shell Oil Company;
(3) Could take place in your team.

Education

Pennsylvania State University, University Park, PA — GPA 3.91/4.00
Ph.D. Mechanical Engineering (Major), Computational Science (Minor) — *Aug 2012 – present*
M.S Mechanical Engineering — *Aug 2012 – May 2016*

Tsinghua University, Beijing, China — GPA 3.70/4.00
B.S. Instrumentation and Controls Engineering — *Aug 2008 – July 2012*

Skills

Programming: Matlab/Simulink (*daily use, 5 years*), *C/C++ (course projects/campus competitions)*, LaTeX(*daily use*), Version Control (*Git, daily use*), Linux/Unix Shell Command Line (*Basic Knowledge*)

Industrial Software: PI Processbook (*intern daily use*), Shell Production Universe (*intern daily use*), AutoCAD/Solidworks (*course projects*)

Technical Expertise: Dynamic Systems and Control Theories (*PID, State Space, Predictive Control, 6 relevant publications*)
Signal Processing (*Extended Kalman Filter, FIR Filter, Fault Detection, 4 relevant publications/internship*)
Time Series Analysis/Modeling (*AR, ARX, ARMAX, Box-Jenkins, 2 relevant publications*)
Machine Learning (*LDA, QDA, KNN, CART, K-means, Mixture Model, course projects*)

Work Experience

Information & Controls Lab, Pennsylvania State University — University Park, PA
Research Assistant - Control Algorithm Development for Artificial Pancreas — *Aug 2012 – present*

- NSF Funded Project with 3 journals and 3 conference proceedings: Modeling, Identification, and Control towards Adaptive Personalized Glucose Management for Insulin-Deficient Diabetes.
- Designed data collection experiment protocols that are both clinically practical and highly excited for system identification.
- Proposed a nonlinear data-driven model with multiple physiological inputs to capture the blood sugar dynamics of the diabetic patients. Validated the model with large scale of time-series data (3-day-length data from 30 virtual patients and 5 real patients).
- Applied signal processing algorithms (Extended Kalman Filter, FIR Filter) and time series analysis (ARMAX) to data preprocessing, model parameter estimation and state estimation. Predicted the blood sugar level in 30 minutes with accuracy as high as 85% in terms of FIT values.
- Developed an Adaptive Model Predictive Controller that can "intelligently learn" the model of the patient in real time and deliver personalized therapy regimen.
- Introduced an innovative adaptive filtering algorithm (Variable State Dimension Filter) to detect and estimate the meals taken by patients with a successful detection rate of 96% and false alarm rate of 8%.

Process Automation Control & Optimization Group, Shell Oil Company — Houston, TX
Deepwater R&D Engineer, Post Grad Intern — *May 2015 – Aug 2015*

- Delivered an enhanced pipeline leak detection system together with technical reports ready for commission and deployment in time and quality.
- Highlighted intern personnel by a General Manager at Shell US PhD Intern Symposium. Received a prestigious award nominated by Process Automation Control & Optimization Group.
- Worked in a project team (3 people across 2 different functionality groups). Weekly meet up for brain storming and task distribution. Biweekly report to project managers and line managers. Exposure to risk management, algorithm prototyping (using Matlab) and hands-on implementation (using PI Processbook and Shell Production Universe).
- Enhanced the existing pipeline leak monitor system (only detect oil leakage in steady-state flow) to detect leakage during noisy transient states by introducing model-based fault detection methodologies. The enhanced monitor system covers the full operation time (100%) compared with 60% of time with the original monitor system.

- Identified the bias of the existing estimation algorithm by going through 2 years of plant data, and presented a compensation strategy that achieved 5% improvement of estimation accuracy.
- Sped up the system deployment and replication procedure by modifying the system structures and eliminating redundant codes (Visual Basic).
- Prepared simulation demo videos for operator education purposes.

Course Projects

Machine Learning – Satellite Image Semantics Classification — State College, PA
Team Size: 2 — *Aug 2014 – Dec 2014*
Implemented (self implementation & package used for verification) multiple classification and clustering algorithms and performed k-fold cross validation on a data set containing 2400 images of 8x8 pixels labeled with 14 semantic categories (beach, mountain, etc.). Improved the prediction performance (running time & prediction accuracy) by leveraging Principal Component Analysis (PCA).

Mechatronic Car – Maze Runner — Beijing, China
Team Size: 4 — *Feb 2012 – May 2012*
Designed and assembled a smart car that searches feasible paths towards target zones in a maze. My work included sensor arrays alignment and installation, Printed Circuit Board (PCB) design of the power system, embedded C programming of its motor control algorithm and path search strategies on a microprocessor (MSP430).

Shopping Assistant Robot — Beijing, China
Team Size: 4 — *Aug 2011 – Dec 2011*
Designed and assembled a robot that assists the disabled shopping in supermarkets. I am responsible for the grasping mechanism of the robot. My work included kinematic analysis, material strength check, technical drawing (AutoCAD, Solidworks), manufacturing process design, assembling and testing. Runner-up in a campus mechanical design competition.

REVERTI Game Programming (C) — Beijing, China
Team Size: 1 — *Feb 2009 – May 2009*
A strategy board game for two players programmed by C. Functionalities included player registration and log in, ranking systems, and a simple artificial intelligence (AI).

Honors

- **Vantage Award - Above & Beyond**. Process Automation Control & Optimization Group, Shell Oil Company
- **Session Organizer (2015), Invited Reviewer(2016).** ASME Dynamic Systems and Control Conference
- **Student Travel Award:** 2015 American Control Conference, 2015 Dynamic Systems and Control Conference

Technical Talks

- Meal Detection and Estimation for Type 1 Diabetes: A Variable State Dimension Approach. *Oct 2015. 2015 Dynamic Systems & Control Conference (DSCC), Columbus, OH.*
- Model Predictive Control for Type 1 Diabetes Based on Personalized LTV Model with Insulin and Meal Inputs. *July 2015. 2015 American Control Conference (ACC), Chicago, IL*
- Fault Detection Based on Modeling and Estimation Methods. *July 2015. Shell Deepwater R&D Group Lunch & Learn Seminar. Houston, TX.*

Publications

- **Jinyu Xie**, and Qian Wang. "A Nonlinear Data-Driven Model of Glucose Dynamics Accounting for Physical Activity for Type 1 Diabetes: An in Silico Study." *Accepted. ASME 2016 Dynamic Systems and Control Conference.*
- **Jinyu Xie**, and Qian Wang. "A Variable State Dimension Approach to Meal Detection and Meal Size Estimation: in Silico Evaluation through Basal-Bolus Insulin Therapy for Type 1 Diabetes." *Under review. IEEE Transactions on Biomedical Engineering.*
- **Jinyu Xie**, and Qian Wang. "Meal Detection and Meal Size Estimation for Type 1 Diabetes Treatment: A Variable State Dimension Approach." *In ASME 2015 Dynamic Systems and Control Conference, pp. V001T15A003. American Society of Mechanical Engineers, 2015.*
- Qian Wang, **Jinyu Xie**, et al. "Model Predictive Control for Type 1 Diabetes Based on Personalized Linear Time-Varying Subject Model Consisting of Both Insulin and Meal Inputs An in Silico Evaluation" *Journal of diabetes science and technology (2015): 1932296815586426.*
- Qian Wang, **Jinyu Xie**, et al. "Model Predictive Control for Type 1 Diabetes Based on Personalized Linear Time-Varying Subject Model Consisting of both Insulin and Meal Inputs: an in Silico Evaluation." *American Control Conference, 2015: 5782-5787.*
- Qian Wang, Peter Molenaar, Saurabh Harsh, Kenneth Freeman, **Jinyu Xie**, et al. "Personalized State-space Modeling of Glucose Dynamics for Type 1 Diabetes Using Continuously Monitored Glucose, Insulin Dose, and Meal Intake An Extended Kalman Filter Approach." *Journal of diabetes science and technology 8.2 (2014): 331-345.*