

## EDUCATION

### PhD, Civil Systems

October 2016

UNIVERSITY OF MARYLAND, COLLEGE PARK, MD USA

*Dissertation:* Semantic-driven Modeling and Reasoning for Enhanced Safety of Cyber-Physical Systems

### MS, Systems Engineering

December 2011

UNIVERSITY OF MARYLAND, COLLEGE PARK, MD USA

*Emphasis:* model-based systems design, formal verification and validation

### BS, Industrial Engineering

June 2002

NATIONAL ADVANCED SCHOOL OF ENGINEERING, YAOUND, CAMEROON

*Thesis:* Design of a metrology-based industrial performance evaluation model

## RESEARCH INTERESTS

- **Cyber-Physical Systems (CPS):** Model-Based Systems Engineering (MBSE) tools and techniques for CPS design; software infrastructure for modeling and analyzing system smartness and safety; formal verification, certification methodologies and approaches for complex systems.
- **Artificial Intelligence (AI):** knowledge structures, domain and metadomain (space + time) semantics; planning and scheduling; reasoning infrastructures.
- **Safety:** system theoretic safety of software intensive and distributed systems; safety metrics; delay modeling and analysis; collision avoidance algorithms and strategies.

## RESEARCH AND TEACHING EXPERIENCE

### Assistant Professor

08/2017 - Present

THE UNIVERSITY OF ALABAMA IN HUNTSVILLE – HUNTSVILLE, AL

- Teach model-based systems engineering – ISE 539: *Systems Engineering & Modeling*, which is a graduate-level course for Industrial & Systems Engineering students.

### Postdoctoral Research Fellow

03 - 07/2017

US ARMY RESEARCH LAB - ABERDEEN PROVING GROUND, MD

- Investigate framework and procedures for complex Cyber-Physical System (CPS) architecting and behavior modeling with applications to unmanned aircraft systems design

### Postdoctoral Fellow, Institute for Systems Research

11/2016 - 02/2017

UNIVERSITY OF MARYLAND, COLLEGE PARK, MD

- Conducted research on the development of a decision framework relating to cross-domain model integration for assessment of maturity in multidisciplinary systems design

### Graduate Research Assistant, Institute for Systems Research

11/ 2011 - 10/2016

UNIVERSITY OF MARYLAND, COLLEGE PARK, MD

- Contribute to Systems Engineering and Integration (SEI) research projects for Vehicle Management System (VMS): Unified/System Modeling Language (UML/SysML) and Modelica

Language metamodeling and integration, VMS Electric Power System (EPS) modeling and models transformation

- Research, extract and provide synthesis technical information of various research topics of the SEI lab including energy efficient buildings, micro robotics, collaborative robotics and healthcare

**Teaching Assistant, Institute for Systems Research**

**02/2013 - 05/2016**

UNIVERSITY OF MARYLAND, COLLEGE PARK, MD

- Assist in teaching senior level Systems Engineering class (ENES489P): prepare and grade homework, design, develop materials and conduct lab sessions with Magic Draw software; mentor and grade capstone projects (Spring 2013, Fall 2014, Spring 2015, Fall 2015, Spring 2016)

**Graduate Research Associate**

**06/2012 - 09/2014**

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), GAITHERSBURG, MD

- Research on procedures for systems integration hub: investigation of relationships between ontologies and Bond Graph; OWL-SysML integration for Model-Based System Engineering
- Investigation on heterogeneous ontologies (time and space) and ontological framework for CPS design, verification and validation for standards' development

**Research Intern**

**06 - 08/2014**

UNITED TECHNOLOGIES RESEARCH CENTER (UTRC), EAST HARTFORD, CT

- Developed a framework for establishing and evaluating trustworthiness of cyber-physical and embedded systems.
- Conducted research on security of software for embedded systems and performed presentation of results.

**Research Assistant**

**07 - 12/2011**

ENEGIS LLC, FAIRFAX, VA

- Provided analytical expertise in building, testing and verifying a Visual basic built model quantifying oil and gas production estimates, lease counts and forecast as well as economic and environmental impacts.
- Assisted in methodology elaboration and model outputs quality control; developed results presentations and wrote project reports.

## PUBLICATIONS

### JOURNAL PUBLICATIONS (PEER-REVIEWED)

Petnga, L., & Austin, M. (2016). Model-Based Design and Formal Verification Processes for Automated Waterway System Operations. *Systems*, 4(2), 23.

Petnga, L., & Austin, M. (2016). An ontological framework for knowledge modeling and decision support in cyber-physical systems. *Advanced Engineering Informatics*, 30(1), 77-94.

Petnga L. & Austin M. (2015). Safe Traffic Intersections: Metrics, Tubes, and Prototype Simulation for solving the Dilemma Zone Problem. *International Journal on Advances in Systems and Measurements*, 8(3&4), 241-254

### CONFERENCE PUBLICATIONS (REFEREED)

Petnga L., Austin M.A. and Blackburn M. Semantically-enabled Model-based Systems Engineering of Safety-critical Network of Systems, 27th Annual INCOSE International Symposium (IS 2017). Adelaide, Australia, July 15 - 20, 2017.

Petnga L. and Xu H., Securing Unmanned Aerial Vehicles: Dynamic state estimation under cyber-physical attacks, submitted to the International Conference on Unmanned Aircraft Systems (ICUAS 2016), Arlington, VA, June 7-10, 2016

Petnga L. and Austin M.A., Spatial Ontologies and Models for Safety-Critical Cyber-Physical Systems, International Conference on Complex Systems Engineering (ICCSE 2015). Storrs, USA, November 9 - 11, 2015

Petnga L. and Austin M.A., Tubes and Metrics for Solving the Dilemma Zone Problem, The Tenth International Conference on Systems (ICONS 2015). Barcelona, Spain, April 19 - 24, 2015

Petnga L. and Austin M.A. Semantic Platforms for Cyber-Physical Systems, 24th Annual INCOSE International Symposium (IS 2014). Las Vegas, USA, June 30 - July 3, 2014.

Petnga L. and Austin M.A. Model-Based Systems Engineering for Design and Automated Operation of Modern Waterway Systems, 8th Annual IEEE International Systems Conference (SysCon 2014). Ottawa, Canada, March 31 - April 3 2014.

Petnga L. and Austin M.A. Cyber-Physical Architecture for Modeling and Enhanced Operations of Connected-Vehicle Systems, 2nd International Conference on Connected Vehicles (ICCVE 2013). Las Vegas, NV, December 2-6, 2013.

Petnga L. and Austin M.A. Ontologies of Time and Time-based Reasoning for MBSE of Cyber-Physical Systems, 11th Annual Conference on Systems Engineering Research (CSER 2013). Atlanta, GA, March 19-22, 2013. Best Conference Paper Award.

#### BOOK CHAPTER (IN PREPARATION)

Austin M.A., Petnga L. and Delgoshaei P., Smart cities: Foundations and Principles Chapter 2: Cyber-Physical Systems (CPS) and Smart Cities, Wiley and Sons, 2017

## PRESENTATIONS

### **Symposiums, workshops (abstracts and posters), and invited talks**

Petnga L. Spatial & Temporal Semantics for Enhanced Safety of Networked Cyber-Physical Systems, 1<sup>st</sup> International Symposium on Networked Cyber-Physical Systems (Net-CPS), 19 - 20 May 2016, Technical University (TU), Munich, Germany

Petnga L. and Austin M.A. Space & Time: Tackling Semantic Challenges for MBSE of Cyber-Physical Systems, Thirty anniversary of Systems Research Excellence, The Institute for Systems Research (ISR), May 08, 2015, College Park, MD

Petnga L. Systems Integration and Reasoning for MBSE for Cyber-Physical Systems, 2nd International Spring School on Systems Engineering, IS3E 2014, 12 - 16 May 2014, Garnich, Germany

L. Petnga, D. Spyropoulos, S. Yan, J. Baras, A Framework for an Integrated Modeling Hub for Vehicle Management Systems, MuSyC DSCS Workshop, April 11, 2012, University of California, Berkeley, CA

Petnga L. Tackling semantic challenges for MBSE of Cyber-Physical Systems, ENSE 622 - Master in Systems Engineering Program (UMD), April 20, 2015, College Park, MD

Petnga L. Semantic-Driven Modeling and Reasoning for Cyber-Physical Systems, United Technologies Research Center (UTRC), August 13, 2014, East Hartford, CT

Petnga L. Reasoning Framework for Model-Based Systems Engineering of Cyber-Physical Systems, International Council on Systems Engineering (INCOSE) Chesapeake Chapter, John Hopkins University Applied Physics Laboratory (JHU APL), February 19, 2014, Laurel, MD

Petnga L. Ontologies of Time and Time-based Reasoning for MBSE of Cyber-Physical Systems, US National Institute of Standards and Technology (NIST), Systems Integration Division (SID) Tea Seminar, May 1, 2013, Gaithersburg, MD

## **AWARDS & SCHOLARSHIPS**

- Best Conference Paper Award - 11th Annual Conference on Systems Engineering Research (CSER'13)
- Armed Forces Communications and Electronics Association (AFCEA) scholarship recipient (2010 - 2011)
- Most dynamic student award and Top Performer Student of the Department of Industrial Engineering of the National Polytechnic Institute, Yaounde, Cameroon(2002)
- Academic Excellence Scholarship, Ministry of Higher Education of Cameroon (1998)

## **PROFESSIONAL SERVICE**

- Reviewer, 5th International Conference on Electronics, Communications and Networks (CECNet2015)
- Fellow, International Council for Systems Engineering (INCOSE)
- Certified Project Management Professional (PMP), Project Management Institute (PMI)
- Volunteer, Graduate for Community Service Learning - University of Maryland, College Park, MD

## **AFFILIATIONS**

- Project Management Institute (2011-2015)
- National Society of Black Engineers (2010-2013)
- American Society for Quality (2008-2011)
- International Red Cross Society-Cameroon branch (1997-2002)