Janelle K. Hammond, Ph.D.

Key words : Applied and computational mathematics, numerical methods for modeling, scientific computing, model order reduction, reduced basis methods, data assimilation, uncertainty quantification, simulation of urban flux, numerical analysis of PDEs.

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Current Position

2020-present : **Assistant Professor of Mathematics, Stonehill College.**

Professional Experiences

2018-2020 **Adjunct professor, Sorbonne University, Pierre and Marie Curie, Paris.**
Formerly University Pierre and Marie Curie (Paris VI).
A detailed description can be found under Teaching Experience.

2017-2020 **Post-doctoral researcher INRIA, ANGE research team**.
Uncertainty Quantification for air quality simulation at urban scale.
DIM Math Innov Ile-de-France regional grant recipient : Meta-model corrected by field observations, with application to atmospheric pollution

2014 - 2017 **Doctorate in applied mathematics,** French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR), University Paris-Est, France.
"Reduced basis methods for urban air quality modeling." Under the direction of F. Bourquin, Y. Maday (Sorbonne University), and R. Chakir.
International collaboration 2015- 2016 : **Visiting Student Researcher, University of California, Berkeley**. Environmental Health Sciences Department. Doctoral **mobility grant recipient**.

2015-2017 **Teaching assistant, Université Pierre and Marie Curie (Paris VI), Paris, France**

2015-2016 **Visiting Student Researcher, University of California-Berkeley**
Environmental Health Sciences Department. Urban air quality studies in Fresno.

2014-2015 **Teaching assistant, ESIEE Paris** (Superior Engineering School in Electrotechnique and Electronics)

2012-2013 **English teacher, Wall Street English, Nancy, France**

2009 - 2011 **Mathematics tutor, teaching assistant, UW-La Crosse**

Education

11/2017 **Doctorate in applied mathematics, IFSTTAR**.

2014 **MS in Mathematics (year 2)**, Université Pierre et Marie Curie (Paris VI), Paris, France. Mathematics for Modeling, major in numerical analysis and PDEs. Graduated with **high honors** (Très Bien). Programming project : approximation of Navier-Stokes in C++. Masters research thesis "Non-Intrusive Reduced Basis Applied to Geotechnics" (advisor R. Chakir). **Grant recipient** from Inria and FSMP, 2013-2014.

2013 **MS in Mathematics (year 1)** Université de Lorraine-Nancy, Elie Cartan Institute, Nancy, France. Mathematical engineering and information technology specialty, **honors** (Bien). Research project in numerical analysis of a conductivity problem inspired by medical imaging.

2011 **BS in Mathematics and French**, University of Wisconsin - La Crosse
Graduated with **highest honors** in December 2011 (early graduation), double major in Mathematics and French. GPA 3.93. Research project : Mathematics of music, presentation at a Math Association of America conference, May 2011. Article published : "Mathematics of music", UW-La Crosse Journal of Undergraduate Research.
Study abroad in Nancy, France : DELF B2 French language diploma.

Skills and qualifications

Applied Mathematics for Engineering, Scientific Computing	Scientific computing ; variational approximation by finite elements/differences/volumes ; analysis and numerical solution of PDEs for urban flux. Model order reduction methods. Incorporation of measurement data and simulations, for data assimilation and uncertainty quantification.
Programming	Programming in C++, Python, FreeFem++, Matlab, Scilab, R. Basic knowledge of bash, Fortran. Software : Code_Saturne (computational fluid mechanics), Salomé (mesh generation), Paraview (visualization).
Teaching	General and applied mathematics, programming for applied mathematics and scientific computing, English (ESL).
Languages	English (maternal language), French (bilingual).

Research Themes

— Scientific computing, numerical methods for modeling
— Reduced basis methods, model order reduction
— Variational data assimilation
— Uncertainty quantification for urban air quality

Publications

2021 J.K. Hammond, R. Chakir. "PBDW : a non-intrusive reduced basis data assimilation method and its application dispersion modeling over Fresno, California." [In preparation]

2020 Hammond, J. K., et al."Meta-Modeling of a Simulation Chain for Urban Air Quality." Advanced Modeling and Simulation in Engineering Sciences, vol. 7, no. 1, Sept. 2020, p. 37. BioMed Central, doi :10.1186/s40323-020-00173-2.

2019 Hammond, J. K., et al. "PBDW : a non-intrusive reduced basis data assimilation method and its application to an urban dispersion modeling framework." Applied Mathematical Modelling, vol. 76, Dec. 2019, pp. 1-25. Crossref, doi :10.1016/j.apm.2019.05.012.

2018 Chakir, R., and J.K. Hammond. "A non-intrusive reduced basis method for elastoplasticity problems in geotechnics." Journal of Computational and Applied Mathematics, vol. 337, Aug. 2018, pp. 1-17. ScienceDirect, doi :10.1016/j.cam.2017.12.044.

2017 Dissertation : Janelle K. Hammond. "Reduced basis methods for urban air quality modeling." Université Paris Est ; IFSTTAR, 2017. https ://hal.archives-ouvertes.fr/tel-01742435

Presentations Conferences, seminars, workshops

January 2020 Joint Mathematical Meetings, Denver. "Meta-modeling and uncertainty quantification of an air quality simulation chain at urban scale."

June 2019 International Conference on Uncertainty Quantification in Computational Sciences and Engineering, Greece. "Uncertainty quantification of an air quality simulation chain at urban scale"

April 2019 Sorbonne University, Laboratoire Jacques-Louis Lions, Paris. Global overview of research contributions and project. One of ten finalist candidates for Assistant Professorship.

June 2018 CANUM, France. "PBDW : a reduced order variational data assimilation method for real-time monitoring of urban air quality"

June 2017 ADMOS, Italy. "PBDW : a non-intrusive Reduced Basis Data Assimilation method and its application to outdoor air quality models"

May 2017 YM'60, France. Poster. "A non-intrusive reduced basis data assimilation method and its application to outdoor air quality models"

April 2017 Inria SERENA, Paris, internal seminar. "A non-intrusive reduced basis data assimilation method and its application to outdoor air quality models"

October 2016 Reduced Basis Summer School, Germany. "Non-intrusive reduced basis methods applied to outdoor air quality models"

June 2016 European Congress on Computational Methods in Applied Sciences and Engineering, Greece. "Non-intrusive reduced basis methods applied to outdoor air quality models"

May 2016 International Transport and Air Pollution Conference, France. Poster. "Non-intrusive reduced basis methods for pollutant transport models"

July 2015 Doctoral Seminar of COSYS department (IFSTTAR), Paris. Poster. "Reduced basis methods for urban modeling" (1st place)

June 2015 Congress, French Society of Applied and Industrial Mathematics (SMAI), France. Poster. "Non-intrusive reduced basis methods applied to geotechnical modeling" (1st place)

October 2014 FreeFem++ Days workshop, Paris. "Non-intrusive reduced basis methods applied to geotechnics modeling"

Teaching Experience

2018-2020 **Adjunct professor, Sorbonne University (Pierre and Marie Curie)**

- **RESPE unit : remedial math for recent immigrants** : (planned for winter semester 2020) preparation courses in mathematics for recent immigrants, mostly asylum seekers and non-traditional students. Preparing students to enroll in undergraduate studies in various scientific majors, review of topics studied in French high school math classes, including introductory calculus and analysis, with additional emphasis on mathematical vocabulary in French and understanding the university system.
- **Applied Analysis** : discussion section, two groups, 1.5h/week. Final year of undergraduate studies. Responsibilities included finalizing problem sets, writing questions for quizzes, grading quizzes and midterms.
- **Numerical methods for differential equations** : programming lab, three semesters, two groups for 2h/week. Final year of undergraduate studies. Introduction to Python or Scilab and study of numerical methods for ordinary differential equations. Evaluation by graded programming exercises, or programming projects with a final presentation and report. Responsibilities included writing original exam questions, exercise sets, and project subjects (such as population dynamics and modeling of red blood cells). Collaborating with the lecturing professor and other adjunct instructors to form a functional educational team was necessary.

2015-2017 **Doctoral teaching assistant, University Pierre and Marie Curie**

- **Introduction to differential equations** : discussion section, 2h/week. Introduction to ordinary differential equations and classical solution methods. Responsibilities included writing problem sets, quiz questions, and grading.

— **Differential equations - elements of analysis and numerical approximation** : programming lab, 2h/week. Introduction to Scilab and numerical methods for ordinary differential equations. Responsibilities included writing original programming exercise sets and exam questions.
— **Initiation to C++** : programming lab, 3h/week. Master's students. Introductory exercises in C++. Responsibilities included guiding students with highly variable programming experience during lab sessions and towards appropriate online resources, correcting exercise sets, and proctoring exams.
— **PDEs and their resolution by finite element methods** : programming lab, 2h/week. Master's students. Rapid introduction to C++, gnuplot, use of a pre-written finite elements class, application to simple PDEs (e.g. 1D Laplace). Responsibilities included finalizing and updating exercise sets for programming labs, and guiding students beginning semester-long programming projects applied to Navier-Stokes.

2014-2015 **Doctoral teaching assistant, ESIEE Paris (Superior Engineering School in Electrotechnique and Electronics)**

— **First-year general mathematics** : discussion sections, two groups, 2h/week. Responsibilities included ensuring effective work sessions and student comprehension, providing explanations and exercise solutions.
— **English** : conversation class, 2h/week. Responsibilities included designing activities and exercises on scientific topics. Contextualization through mini-projects of topics related to engineering and mathematics research.

2012-2013 **English teacher, Wall Street English, Nancy, France**
English as a second language teaching 12h/week to small groups of adults, larger groups during activity and conversation sessions. Responsibilities included developing language games, grammar exercises, revision games, and conversation activities.

2009-2011 **Tutoring and teaching assistant, University of Wisconsin- La Crosse**
Six semesters, 5h/week. Available for drop-in tutoring to provide individual help with specific questions and general concepts. As a teaching assistant, responsibilities included leading a group revision session for College Algebra classes, 2h/week, designing revision sessions and preparing additional exercises to cover.

Hobbies and Interests

I enjoy various outdoor activities, particularly skiing, hiking, and camping. I play percussion in multiple community music groups. I enjoy music (particularly jazz and swing dancing), reading, theater, and travel.