Lara Backer

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Skills

Software Languages: Python, Perl, Fortran 90/77, C++/C, HTML
Software Tools: MatLab, FlameMaster, Cantera, ANSYS Fluent/Chemkin, Microsoft Office, LaTeX, UNIX OS
General: Chemical Kinetics, Combustion, Computational Fluid Dynamics, Data Analysis, Algorithms, Optimization, Parallel Computing (OpenMP, MPI), Machine Learning (beginner level)

Education

PhD Candidate, MaSc - Cornell University August 2013 – May 2019 (expected)
Mechanical Engineering GPA 3.86
Graduate field: fluid dynamics, minor in computational science and engineering
Committee: Perrine Pepiot, Stephen Pope, Olivier Desjardins

- Using computational fluid dynamics (CFD) to analyze the role of multi-component fuels in evaporation and turbulent combustion; developing software tools to increase the efficiency of combustion simulations
- Contributions to NGA (a DNS/LES CFD framework in Fortran), an atom tracking code for understanding nonlinear fuel interactions, and software tools for automatic kinetic mechanism reduction
- Additional work scripting with MatLab, Perl, and Python; CPU parallelization with MPI

BaSc - University of British Columbia September 2008 – April 2013
Engineering Physics GPA 3.7

Work History

Graduate Teaching Assistant – Cornell University (Ithaca, NY)
ENGRD 2210 – Thermodynamics August 2018 – December 2018
- Hosted weekly recitation sections, office hours, and exam review sessions for over 200 students
- Assisted in creating exam questions, writing homework solutions, and grading

ENGRI 1510 - Modeling and simulation of real-world scientific problems January 2017 – May 2017
- Led classes of over 20 middle-school-aged students in learning basic science and programming concepts
- Developed interactive Python codes describing planetary motion, image processing, music, and evolution

MAE 4230/5230 - Intermediate fluid dynamics January 2014 – May 2014
- In charge of creating and updating ANSYS FLUENT tutorials on Cornell's Fluent Tutorials webpage
- Held practical lab recitations and hosted office hours

Coanda Research and Development Corporation (Burnaby, BC) May 2012 – July 2013
Instrumentation Engineer
- Built and ran systems to model and optimize flue gas deionization and multiphase oil de-sander processes
- Used in-house Linux programs to acquire data; installed large electrical networks to power the systems; troubleshot and installed pumps, flow meters, and various sensors
- Created the electronics, packaged, and designed circuitry for a light detector used in a fluidized bed reactor and for a conductivity measuring sensor for opaque particle laden flows

Mechanical Engineering Department - UBC (Vancouver, BC) May 2011 – September 2011
Research Assistant – Pulp and Paper Center
- Designed and built an experiment to analyze velocity fields of fluid near paper forming fabric
- Developed a novel method of using micro-PIV (laser-based) analysis for deep flow measurements

Apparent Networks (Vancouver, BC) January 2010 – May 2010
Software Tester – QA Department
- Wrote Java scripts using Eclipse to automate software testing. Developed new testing methods using Selenium, a software-testing platform.

Awards and Achievements

- DOE CSGF (graduate fellowship internship) award recipient - Summer 2017
- ESSCI Charles P. Fenimore Best Student Presentation Award – Spring 2016
- NSF GFRP Research Fellow – April 2014-August 2018
- UBC Ahmad Bhimani Memorial Scholarship – 2012-2013
- NSERC Industrial USRA Award Recipient – May-August 2012
- NSERC Award Recipient – May-August 2011
- National Merit Scholarship – 2008

Papers and Conference Presentations

L. Backer, P. Pepiot. "Rate-based construction of reduced mechanisms and additive modules." – *in progress*
L. Backer, P. Pepiot. "Automatic identification and lumping of fuel decomposition pathways for the reduction of detailed high temperature combustion kinetic mechanisms." – *in progress*
M. Costa, D. Alviso, **L. Backer**, P. Pepiot. N. Darabiha, R. Gonçalves dos Santos. "A compact chemical kinetic mechanism for diesel/biodiesel and ethanol surrogates using n-decane/methyl-decanoate/ethanol blends" - *submitted*
L. Backer, P. Pepiot. "A fully-automated kinetic mechanism lumping algorithm" in *2018 ESSCI Spring Meeting,* State College, PA, March 2018.
L. Backer, P. Pepiot. "Capturing component interactions in multi-component fuel reduction" in *2017 10th National Combustion Institute Meeting,* College Park, MD, April 2017.
L. Backer, P. Pepiot. "Numerical investigation into the auto-ignition of a multicomponent fuel spray" in *2016 ESSCI Spring Meeting,* Princeton, NJ, March 2016.
L. Backer. "A numerical investigation of the role of complex fuels in spray combustion" in *Sibley Graduate Research Symposium*. Cornell University, January 2016.
L. Backer. "Numerical investigation of spray ignition of a multi-component fuel surrogate" in *67th Annual Meeting of the APS Division of Fluid Dynamics*. San Francisco, November 2014.

Volunteer Experience

Cornell University May 2015-May 2017

- President and events coordinator of Mechanical and Aerospace Engineering Graduate Association
- Graduate and Professional Student Association (GPSA) representative for Mechanical Engineering
- Co-ordinated high school 4-H engineering outreach days; planned and presented fluid dynamics session

UBC Engineering Undergraduate Society
Vice-President Academic May 2012-May 2013

- In charge of organizing group and individual tutoring sessions for several thousand engineering students
- Initiated a school-wide exam database, introduced faculty midterm teaching evaluations

Professional Relations Manager May 2010 – May 2011

- Hosted a Logbook Seminar, Alumni Mixer, EIT/GIT information seminar, and Professional Industry Night.

UBC Engineering Physics Student Association September 2009 - Present
President, May 2011-May 2012; VP Events, May 2010-May 2011; Year representative, Sept. 2009-May 2010

- Revised the association constitution, pioneered hosting a cross-campus technical career fair
- Tutored approximately 150 first-year students in Physics (dynamics, magnetism, electricity)

Selected Project Experience

ENPH 479 – Senior Thesis Project September 2012 - January 2012

- Performed experiments using viscous fluid and particles to analyze surface tension effects on clustering
- Wrote MatLab code to process images for particle mapping

ENPH 459 – Junior Thesis Project August 2011 – April 2012

- Used Labview and NI-DAQ to automate stepper motor and piezo actuator scans using a microscope and laser setup to detect silver nanoparticle emission spectra