Mandar D. Kulkarni kmandar@vt.edu
1238 University City Blvd, Apt. 141 M, Blacksburg VA 24060 (617) 806-6117

EDUCATION

PhD candidate in Aerospace and Ocean Engineering Department *(Aug. 2011- present)*
Virginia Polytechnic Institute and State University, Blacksburg, USA; *GPA: 3.85/4.00*

Bachelor of Technology and Master of Technology in Aerospace Engineering *(Jul. 2004 – Jun. 2009)*
Indian Institute of Technology (IIT) Bombay, Mumbai, India
Specialization: Aerospace Structures; GPA: 9.42 / 10.0

INDUSTRIAL EXPERIENCE

Airbus Engineering Centre, Bangalore, India *(Apr. 2010 – May 2011)*
Associate Engineer in Loads and Aeroelasticity Team

- Work included estimation of loads on aircraft during various manoeuvres for aircraft design certification.
- Required application of flight mechanics, aeroelasticity and structural analysis.

MSC Software (Symphony Technology Group), Pune, India *(Jul. 2009 – Mar. 2010)*
Senior Application Engineer in Verification and Validation (V&V) Team

- Involved in V&V of new developments in the finite element solver NASTRAN®.
- Completed projects related to statics, frequency response, non-linear analysis, aeroelasticity.

Department of Statistics, University of Klagenfurt, Klagenfurt, Austria *(May 2007 – Jul. 2007)*
Intern for the project 'Spatial prediction using Bayesian Trans-gaussian Kriging'

- Optimized a MATLAB® program used for spatial prediction of an event using Kriging techniques.

RESEARCH EXPERIENCE

Non-intrusive Continuum Sensitivity Analysis for Aeroelastic Shape Optimization *(Ph.D. Thesis)*
Advisor: Dr. Robert A. Canfield, Aerospace and Ocean Engineering, Virginia Tech (Nov. 2012 – present)

- Investigating methods of implementing **(analytic) Continuum Sensitivity Analysis**.
- Goal is to formulate a non-intrusive (or black-box) method of sensitivity analysis for shape optimization, which is **more accurate and less computationally expensive** than the current methods.
- Extend the non-intrusive method for nonlinear aeroelasticity applications.
- Explore an adjoint formulation of CSA to account for large number of design variables.

Aerodynamic Modeling of Flapping Wing Micro-Air-Vehicles (MAVs)
Advisor: Dr. Mayuresh J. Patil, Aerospace and Ocean Engineering, Virginia Tech (Aug. 2011 – Oct. 2012)

- Developed a **reduced order aerodynamic model** for unsteady aerodynamics of flapping flight.
- This model is based on Unsteady Vortex Lattice Method (UVLM) and Momentum Disc Theory.
- This model is better than quasi-steady models and could be used for **conceptual MAV design**.

Active Vibration Control of Aircraft Structure using Piezo-ceramic Stack Actuators *(Masters Thesis)*
Advisor: Prof. Prasanna M. Mujumdar, Aerospace Engineering, IIT Bombay (May 2008 – Jun. 2009)

- Experimentally demonstrated **active vibration control** of wing box of a typical fighter aircraft by designing optimal control law and implementing it using state-of-the-art data acquisition system.
- Performed simulations and experiments to establish use of **Piezo-ceramic stacks** for vibration control.
- Acquired expertise in data acquisition, signal processing, and frequency response experimentation techniques.

Stress Wave Attenuation during Ballistic Impact on a Ceramic Target *(Jul. 2006 – Mar. 2008)*

Advisor: Prof. Niranjan K. Naik, Aerospace Engineering, IIT Bombay

- Numerically and experimentally demonstrated **attenuation of stress wave**s due to ballistic impact on ceramic tiles.
- Proposed the **novel concept of stress wave attenuation coefficient** for ceramics tiles.
- Possible applications in design of armors and military vehicles.

Effect of Back Pressure on Impact Characteristics of Composites *(May 2006 – Aug. 2006)*

Advisor: Prof. Niranjan K. Naik, Aerospace Engineering, IIT Bombay

- Experimentally investigated the effect of **low-velocity-impact** on pressurized composite vessels.
- Possible applications in design of composite pressure vessels, aircraft fuselage.

PUBLICATIONS

Journals:

- M. D. Kulkarni, R. A. Canfield, and M. J. Patil, "Nonintrusive Continuum Sensitivity Analysis for Three Dimensional Structures: Direct and Adjoint Formulations," *Structures and Multidisciplinary Optimization* (In preparation as of **Oct. 2015**).
- M. D. Kulkarni, D. M. Cross, and R. A. Canfield, "Discrete Adjoint Formulation using Local Continuum Sensitivity Equations," *AIAA Journal* (In press as of **Oct. 2015**).
- R. Goel, M. D. Kulkarni, K. S. Pandya, and N. K. Naik, "Stress Wave Micro–Macro Attenuation in Ceramic Plates Made of Tiles during Ballistic Impact," *International Journal of Mechanical Sciences*, Vol. 83, Issue 2, pp. 30-37, **Mar. 2014**.
- M. D. Kulkarni, R. Goel, and N. K. Naik, "Effect of Back Pressure on Impact and Compression-after-Impact Characteristics of Composites," *Composite Structures*, Vol. 93, Issue 2, pp. 944-951, **Jan. 2011**.
- N. K. Naik, R. Goel, and M. D. Kulkarni, "Stress Wave Attenuation in Ceramic Plates," *Journal of Applied Physics*, Vol. 103, Issue 10, Article No. 103504, **May 2008**.

Conferences:

- M. D. Kulkarni, R. A. Canfield, and M. J. Patil, "Non-intrusive Continuum Sensitivity Analysis for Aerodynamic Shape Optimization," *16th Multidisciplinary Analysis and Optimization Conference, AIAA Aviation*, Paper No. AIAA-2015-3237, Dallas, TX, USA, **Jun. 2015**.
- M. D. Kulkarni, R. A. Canfield, and M. J. Patil, "Discrete Adjoint Formulation using Local Continuum Sensitivity Equations," *56th AIAA Structures, Structural Dynamics and Materials Conference, AIAA SciTech*, Paper No. AIAA-2015-0138, Kissimmee, FL, USA, **Jan. 2015**.
- M. D. Kulkarni and R. A. Canfield, "Reliability Based Structural Design using Continuum Sensitivity Analysis," *56th AIAA Structures, Structural Dynamics and Materials Conference, AIAA SciTech*, Paper No. AIAA-2015-0458, Kissimmee, FL, USA, **Jan. 2015**.
- M. D. Kulkarni, R. A. Canfield, and M. J. Patil, "Non-intrusive Continuum Sensitivity Analysis for Aeroelastic Shape Optimization," *15th Multidisciplinary Analysis and Optimization Conference, AIAA Aviation*, Paper No. AIAA-2014-2043, Atlanta, GA, USA, **Jun. 2014**.
- M. D. Kulkarni, R. A. Canfield, M. J. Patil, E. J. Alyanak, "Integration of Geometric Sensitivity and Spatial Gradient Reconstruction for Aeroelastic Shape Optimization," *10th Multidisciplinary Design Optimization Conference, AIAA SciTech*, Paper No. AIAA-2014-0470, National Harbor, MD, USA, **Jan. 2014**.
- M. D. Kulkarni, M. J. Patil, R. D. Snyder, "Reduced Order Model for Unsteady Aerodynamics of Flapping Wing Micro Air Vehicle in Hover," *54th AIAA Structures, Structural Dynamics and Materials Conference, AIAA SciTech*, Paper No. AIAA-2013-1645, Boston, MA, USA, **Apr. 2013**.

- M. D. Kulkarni, G. Kumar, P. M. Mujumdar, and A. Joshi, "Active Control of Vibration Modes of Wing Box by Piezoelectric Stack Actuators," *51st AIAA Structures, Structural Dynamics and Materials Conference*, Paper No. AIAA-2010-2949, Orlando, FL, USA, **Apr. 2010**.
- M. D. Kulkarni, R. Goel, and N. K. Naik, "Effect of Back Pressure on Impact Behavior of Composites," *4th International Conference on Theoretical, Applied, Computational and Experimental Mechanics*, IIT Kharagpur, India, **Dec. 2007**.
- R. Goel, M. D. Kulkarni, and N. K. Naik, "Stress Wave Attenuation during Ballistic Impact on a Ceramic Target," *16th International Conference on Composite Materials*, Kyoto, Japan, **Jul. 2007**.

AWARDS AND ACHIEVEMENTS

- Awarded '**Dr. Shankar Dayal Sharma Gold Medal**' for being the most outstanding student in general proficiency, excellence in academic performance, extra-curricular activities and social services among all 1600 degree recipients of IIT Bombay in the year 2009.
- Awarded **Institute Silver Medal** and **Boeing Scholar Award** for standing 1st among Dual Degree (B.Tech, M.Tech) students of Aerospace Engineering Department, IIT Bombay in the year 2009.
- Awarded **Pratt Fellowship** based on outstanding performance as a graduate student, for the academic year 2014-2015.
- Won 6th place in 2nd **International Cold Formed Steel Student Design Competition** in 2012.
- **Finalist in AIAA 2015 Student Competition:** Qualified for the final round of student competition at AIAA Multidisciplinary Analysis and Optimization Conference, Jun. 2015.
- **Best paper presentation**: Won the first prize for the project on 'Composites Structures' in national level students' paper presentation competition at 'Zephyr 2006', Aerospace Engg. Association, IIT Bombay.
- **Winter Academy 2007**: One of the seven students to represent IIT Bombay at the annual Indo-German students meeting at Guwahati, India; Presented a talk on 'Finite Element Analysis of Dynamic Systems'.

COMPUTER SKILLS

- **Software:**
  Structural Analysis: NASTRAN, PATRAN, ABAQUS, ANSYS
  Fluid Analysis: FLUENT, ZEUS, ZAERO, OpenFOAM, SU2
  Other: LabVIEW, AUTOCAD, MATLAB, SIMULINK
- **Languages:** C, C++, Fortran, Python, MATLAB, Shell scripting

EXTRA-CURRICULAR ACTIVITIES

- **Amateur HAM Radio:** Involved in amateur radio activities (US Technician License – KK4SXZ)
- **Amateur Astronomy:** Observe and record meteor showers, occultation etc.
- **Other hobbies:** Paper aero-modeling, trekking, water rocketry, cycling, reading thrillers, ambigraphy

REFERNCES

Dr. Robert A. Canfield
Professor & Assistant Head
Aerospace Engineering Department
Virginia Tech
Blacksburg, VA 24061, USA
bob.canfield@vt.edu
Phone: +1 (540) 231-5981

Dr. Mayuresh J. Patil
Associate Professor
Aerospace Engineering Department
Virginia Tech
Blacksburg, VA 24061, USA
mjpatil@vt.edu
Phone: +1 (540) 231-8722