

# **Dr. PANKAJ SHARADCHANDRA KOLHE**

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## **EDUCATION**

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<b>PhD (Mechanical Engg)</b> , Univ. of Alabama, Tuscaloosa (August 2009)	<b>GPA: 4.0/4.0</b>
<b>MS (Mechanical Engg)</b> , Univ. of Alabama, Tuscaloosa (May 2008)	<b>GPA: 4.0/4.0</b>
<b>M.Tech. (Aerospace Engg)</b> , IIT Bombay, Powai, Mumbai. (August 2003)	<b>CPI: 8.82/10.0</b>
<b>B.E. (Mechanical Engg)</b> , Univ. of Pune, (August 1999)	<b>Grade: 1<sup>st</sup> class with Distinction.</b>

## **WORK EXPERIENCE**

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<b>Assistant Research Engineer</b> (Dept. of Mechanical Engg., Univ. of Alabama, Tuscaloosa)	<b>11/09 – present</b>
<b>Graduate Research Assistant</b> (Dept. of Mechanical Engg., Univ. of Alabama, Tuscaloosa)	<b>01/05 – 08/09</b>
<b>Senior Research Assistant</b> (Dept. of Aerospace Engg., IIT Bombay, Mumbai, India)	<b>02/03 - 07/04</b>
<b>Graduate Research Assistant</b> (Dept. of Aerospace Engg. IIT Bombay, Mumbai, India)	<b>07/01 - 01/03</b>

## **Research Interests**

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- ❖ Rainbow Schlieren Deflectometry
  - Flow geometry optimization for heating, ventilation, and air conditioning systems.
  - Noise source detection and propagation in reacting and non-reacting flows.
  - Measurements of eddy convection velocity, length & time scales, mean and fluctuation intensity of scalars in turbulent flows.
- ❖ Phase Doppler Particle Analyzer
  - Characterizing nozzle spray characteristics for optimizing the flow recirculation geometry for liquid fuel combustion.
  - Investigating sensor array concepts for ultra high resolution spacetime cross correlations of velocity in turbulent flows.
- ❖ Stereoscopic Particle Image Velocimetry

- Simultaneous whole field 3-component velocity measurements and validation of numerical models.
- ❖ Liquid Fuel Combustion
  - Thermal and catalytic partial oxidation of alternative fuels for syngas production.
  - Novel combustor designs for combustion of bio-mass and its byproduct derived fuels.
  - Investigation of liquid fuel combustion acoustics and its suppression concepts.
  - Low temperature combustion of diesel in CI engines.

### **SPONSORED PROJECTS WORKED ON AT UNIV. OF ALABAMA**

- High-Speed Rainbow Schlieren Deflectometry to Quantify Buoyancy Effects in Transitional/Turbulent Gas Jet Flames, *funded by NASA*
- Small-Scale Flow Experiments to Support Development of Hydrogen Codes and Safety Standards, *funded by Sandia National Laboratory, Livermore California.*
- Biofuel Combustion, *funded by Southern Company*
- Low Emissions Burner Technology for Metal Processing Industry using Byproducts and Biomass Derived Liquid Fuels, *funded by U.S. D.O.E. (Award Number: EE0001733)*
- Institute for Sustainable Energy, *funded by U.S. D.O.E. (Award Number: EE0003134)*

### **JOURNAL PUBLICATIONS**

1. **Kolhe P. S.**, Agrawal A. K. (2010), “Investigation of the Cross-Beam Correlation Algorithm to Reconstruct Local Field Statistics from Line-of-Sight Measurements in Turbulent Flows,” *Flow Turbulence and Combustion*. DOI: [10.1007/s10494-009-9244-9](https://doi.org/10.1007/s10494-009-9244-9).
2. **Kolhe P. S.**, Agrawal A. K. (2009), “A Novel Spectral Analysis Algorithm to Obtain Local Scalar Field Statistics from Line of Sight Measurements in Turbulent Flows,” *Measurement Science and Technology*, **20**(11). DOI: [10.1088/0957-0233/20/11/115402](https://doi.org/10.1088/0957-0233/20/11/115402).
3. **Kolhe P. S.**, Agrawal A. K., (2009) “Techniques for Abel inversion of deflectometric data: assessment of accuracy and noise propagation,” *Applied optics*, **48**(20), pp.3894-3902. <http://dx.doi.org/10.1364/AO.48.003894>
4. **Kolhe P. S.**, Agrawal A. K., (2009), “Density Measurements in a Supersonic Microjet Using Miniature Rainbow Schlieren Deflectometry,” *AIAA Journal*, **47**(4), pp. 830-838. <http://arc.aiaa.org/doi/pdf/10.2514/1.37332>

5. **Kolhe P. S.**, Agrawal A. K., (2007), “Role of buoyancy on instabilities and structure of transitional gas jet diffusion flames,” *Flow Turbulence and Combustion*, **79**(4), pp. 343-360. <http://link.springer.com/article/10.1007%2Fs10494-007-9098-y>
6. Satti R. P., **Kolhe P. S.**, Olcmen S., and Agrawal A. K., (2007), “Miniature rainbow schlieren deflectometry system for quantitative measurements in microjets and flames,” *Applied Optics*, **46**(15), pp. 2954-2962. <http://dx.doi.org/10.1364/AO.46.002954>
7. Mahulikar S. P., Potnuru S. K., and **Kolhe P. S.**, (2007) “Analytical estimation of solid angle subtended by complex well-resolved surfaces for infrared detection studies,” *Applied Optics*, **46**(22), pp. 4991-4996. <http://dx.doi.org/10.1364/AO.46.004991>
8. Mahulikar S. P., Rao G. A., and **Kolhe P. S.**, (2006), “Infrared signatures of low-flying aircraft and their rear fuselage skin’s emissivity optimization,” *Journal of Aircraft*, **43**(1), pp. 226-232. <http://arc.aiaa.org/doi/abs/10.2514/1.15365?journalCode=ja>
9. Mahulikar S. P., **Kolhe P. S.**, and Rao G. A., (2005) “Skin-temperature Prediction of aircraft rear fuselage with multimode thermal model,” *Journal of Thermophysics and Heat Transfer*, **19**(1), pp. 114-124. <http://arc.aiaa.org/doi/abs/10.2514/1.6299?journalCode=jtht>

#### **TECHNICAL ARTICLES IN PREPARATION**

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1. Chaganti Narendra, **Kolhe P. S.**, and Semih Ölçmen, “Study of Shock-wave Boundary-layer Interaction using Rainbow Schlieren Deflectometry.” Submitted to *Experiments in Fluids* for review.
2. **Kolhe P. S.**, Agrawal A. K., “Space-time correlation measurements in turbulent low density jets using ultra-high speed rainbow schlieren deflectometry.” (*Targeted Journal: Journal of Fluid Mechanics*)
3. **Kolhe P. S.**, Agrawal A. K., “Scalar measurements in a turbulent round helium jet using rainbow schlieren Deflectometry.” (*Targeted Journal: Experiments in Fluids*)
4. **Kolhe P. S.**, Agrawal A. K., “Application of optical deflectometry to eddy convection velocity measurements in a turbulent round helium jet.” (*Targeted Journal: Applied Optics*)
5. **Kolhe, P.S.**, Panchasara H.V., and Agrawal, A.K., “Effect of swirl on non-reacting vegetable-oil spray with and without preheating.” (*Targeted Journal: Atomization and Sprays*)

6. **Kolhe, P.S.**, Panchasara H.V., and Agrawal, A.K., “Flame spray characteristics of preheated vegetable-oil sprays using an air-blast atomizer.” (*Targeted Journal: Energy and Fuels*)
7. Panchasara H.V., **Kolhe, P.S.**, and Agrawal, A.K., “Enclosed flames spray characteristics and emissions with preheated vegetable-oil using an air-blast atomizer.” (*Targeted Journal: Combustion Science and Technology*)

## **CONFERENCE PUBLICATIONS**

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1. **Kolhe P. S.**, Agrawal A. K., “Turbulence Measurements for Numerical Validation Acquired by Ultra High-speed Rainbow Schlieren Deflectometry.” *AIAA Science and Technology Forum and Exposition 2014: 52nd Aerospace Sciences Meeting*, National Harbor Maryland, 13-17 January 2014.
2. **Kolhe P. S.**, Agrawal A. K., “Rainbow schlieren deflectometry for statistical description of turbulent Low-Density Jets.” *8<sup>th</sup> US National Combustion Meeting*, Salt Lake City, UT, May 19-22, 2013.
3. **Kolhe, P.S.**, and Agrawal, A.K., (2012), “Ultra high speed rainbow schlieren deflectometry for turbulence measurements in jets and flames,” *Spring Technical Meeting of the Central States Section of the Combustion Institute* Dayton, Ohio, April 22-24, 2012.
4. Jiang L., **Kolhe P.S.**, Taylor R.P., and Agrawal A.K., “Measurements in a combustor operated on alternative fuel,” 50<sup>th</sup> AIAA Aerospace Science Meeting, Nashville, Tennessee, January 6-9, 2012.
5. Simmons B M, **Kolhe P S**, Taylor R P, and Agrawal A. K. (2010), “Glycerol combustion using flow-blurring atomization,” *Spring Technical Meeting of the Central States Section of the Combustion Institute* Urbana-Champaign, Illinois, March 21-23, 2010.
6. **Kolhe, P.S.**, and Agrawal, A.K., (2009), “A spectral analysis algorithm to obtain scalar turbulence data from deflectometric measurements,” 47<sup>th</sup> AIAA Aerospace Science Meeting, Orlando, Florida, *AIAA Paper-2009-73*.
7. **Kolhe, P.S.**, and Agrawal, A.K., 2008, “Scalar measurements in under-expanded micro-jets,” 46<sup>th</sup> AIAA Aerospace Science Meeting, Reno, Nevada, *AIAA Paper 2008-238*.
8. **Kolhe, P.S.**, Ivanchenko, O., Agrawal, A.K., and, Olcmen, S., 2008, “Experimental measurement of density, pressure, and temperature fields in a supersonic free jet using

rainbow schlieren deflectometry,” 46<sup>th</sup> AIAA Aerospace Science Meeting, Reno, Nevada, *AIAA Paper 2007-237*.

9. Satti, R., **Kolhe P. S.**, Olcmen S. and Agrawal, A.K., (2007), “Quantitative scalar measurements in micro jets and flames,” 45<sup>th</sup> AIAA Aerospace Science Meeting, Reno, Nevada, *AIAA Paper 2007-0933*.
10. **Kolhe, P.S.**, and Agrawal, A.K., (2007), “Role of buoyancy on instabilities in transitional gas jet diffusion flames,” *5<sup>th</sup> US Combustion Meeting*, San Diego, CA, Paper D-04-Fundamentals.
11. Satti, R., **Kolhe, P.S.**, and Agrawal, A.K., (2006), “Crossbeam rainbow schlieren deflectometry technique for scalar measurements in turbulent flows,” 44<sup>th</sup> AIAA Aerospace Science Meeting, Reno, Nevada, *AIAA Paper-2006-1096*.
12. Satti, R., **Kolhe, P.S.**, Olceman, S., and Agrawal, A.K., (2006), “Rainbow schlieren deflectometry apparatus for diagnostics in micro-scale flow systems,” *Spring Technical Meeting of the Central States Section of the Combustion Institute* Cleveland, Ohio.
13. **Kolhe, P.S.**, Wong, T., and Agrawal, A.K., (2005), “An investigation of flickering behavior in transitional gas jet diffusion flames,” *4<sup>th</sup> Joint Meeting of the Combustion Institute*, March 20-23, Philadelphia, PA, Paper D16.