

# Manoj Kumar Babu

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## RESEARCH INTERESTS

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- Applied Statistical Modelling, Machine Learning, Digital Manufacturing.

## EDUCATION

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- **WMG, University of Warwick** United Kingdom  
*PhD in Industrial and Systems Engineering* Nov. 2014 – Apr. 2019 (Submitted)
- **Indian Institute of Technology (IIT) Kharagpur** India  
*Master of Technology in Industrial Engineering; GPA: 8.98/10.0* Jul. 2012 – Jun. 2014
- **Aeronautical Society of India** India  
*Bachelor of Engineering in Aeronautics; Score: 68/100 (Best performance award)* June. 2006 – Dec. 2010

## TEACHING EXPERIENCE

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- **WMG, University of Warwick** United Kingdom  
*Teaching Assistant* Autumn 2016 – Autumn 2017
  - Formulated the tutorial questions and lead the seminar sessions for the AEP Quality methods module during Autumn and Spring 2017.
  - Assisted the delivery of seminar sessions for the following AEP modules: Static Mechanics (Autumn 2017), Dynamic Mechanics and Thermo-fluids (Autumn 2017), Energy Methods and Fluid Mechanics (Autumn 2016, Spring 2016 and Spring 2017).
- **WMG, University of Warwick** United Kingdom  
*Guest Lecturer* March 2017
  - Delivered the “Sheet Metal Parts for RLW Joining: Variation Modelling and Statistical Process Control” lecture for the WMG Technical Accreditation Scheme sheet metal forming module.
- **IIT-Kharagpur** India  
*Teaching Assistant* Autumn 2013 – Spring 2014
  - Formulated the tutorial questions, lead the seminar sessions and marked answer sheets for the graduate level course Supply Chain Management (Autumn 2013).
  - Lead the seminar sessions and marked answer sheets for the graduate level course Intelligent Manufacturing (Spring 2014).

## RESEARCH & INDUSTRIAL EXPERIENCE

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- **WMG, University of Warwick** United Kingdom  
*Research Assistant* Jan 2018 – Till-date  
In-Process Quality Improvement for digital manufacturing: Developed and utilised statistical modelling and machine learning techniques for in-line quality improvement of a sheet-metal assembly process.
  - Implemented *Spatio-Temporal Adaptive Sampling* methodology for robotic optical 3D-surface scanners to reduce the measurement cycle time.
  - Utilised *Convolutional Neural Networks (CNNs)* to identify and localise product quality defects using 3D-point cloud data.
- **WMG, University of Warwick** United Kingdom  
*Doctoral Student* Nov 2014 – Apr 2019 (Submitted)  
Developed methodologies to model spatial and spatio-temporal correlations in a manufacturing assembly system to improve product quality.
  - Developed a *morphing-Gaussian Random Field* methodology to model and simulate part form error during early design phase and enable accurate simulation of an assembly process.
  - Developed a *Spatio-Temporal Adaptive Sampling* methodology for optical 3D-surface scanners to reduce the measurement cycle time and enable in-line implementation of the scanner.

- IIT-Kharagpur** India  
*Graduate Research Assistant* *July 2013 – June 2014*  
 Decision Support System for Material Handling: Developed a *decision support system* to optimally automate day to day decision making regarding stockyard maintenance and rake loading, for Dhamra Port Corporation Ltd., India.
- Aeronautical Development Agency (ADA), DRDO** India  
*Junior Research Fellow* *Apr 2012 - July 2012*  
 Responsible for the aerodynamic aspects of the Multidisciplinary Design Optimization (MDO) of a transport class aircraft during its design phase and developed a MDO framework to handle the aircraft stability and aerodynamic interactions for the aircraft.
  - Systems Engineering*: Created a systems engineering framework for the conceptual design of a transport class aircraft.
  - Multi-Disciplinary Optimisation (MDO)*: In-charge of Aerodynamic aspects of MDO of a transport aircraft using modeFrontier software.
- Aeronautical Development Establishment (ADE), DRDO** India  
*Project Contract Engineer* *Apr 2011 - Mar 2012*  
 Involved in conceptual and preliminary design, aerodynamic analysis of Unmanned Air Vehicle (UAV), which resulted in a 2.3 kilogram autonomous Mini-UAV with an endurance of 2.5 hours.
  - Conceptual and Aerodynamic Design*: Designed a 2.3 kilogram autonomous UAV with an endurance of 2.5 hours.
  - Aerodynamic and Stability Analysis*: Estimated aerodynamic drag of the UAV using engineering methods. Analysed flight data for characterization of take-off, landing, climb and turn performance of the UAV.
  - Mechanical Design*: Meshed and analysed wing alone configuration of the UAV.

## CERTIFICATION

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- Introduction to teaching and learning in higher education for postgraduates who teach from the University of Warwick (June-2016).

## SOFTWARE AND PROGRAMMING SKILLS

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<b>Scripting</b>	: Matlab, Python, C++	<b>CAD</b>	: CATIA, Solidworks
<b>Robot programming</b>	: Robot Studio	<b>Statistical software</b>	: Minitab
<b>Other Tools</b>	: MS-Office, L <sup>A</sup> T <sub>E</sub> X	<b>Version Control</b>	: Git

## ACADEMIC ACHIEVEMENTS

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- WMG Scholarship**: Awarded full scholarship to pursue PhD at WMG, University of Warwick.
- GATE Score**: Secured 94.9 percentile in national Graduate Aptitude Test in Engineering (GATE) examination.
- MHRD Scholarship**: Awarded Ministry of Human Resource Development (MHRD), Government of India, scholarship to pursue M.Tech at IIT Kharagpur.
- Shri R Venkataraman Prize**: Awarded for best overall performance in associate membership examination of the Aeronautical Society of India.
- All India Ranks**: Have secured top ranks in various subjects in associate membership examination of the Aeronautical Society of India.

## SELECTED PUBLICATIONS

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- Babu, M., Franciosa, P., & Ceglarek, D.** (2019-Accepted). Spatio-temporal adaptive sampling for effective coverage measurement planning during quality inspection of free form surfaces using robotic 3d optical scanner. *Journal of Manufacturing Systems*.
- Pratap, S., **Kumar, M.**, Saxena, D., & Tiwari, M. K. (2016). Integrated scheduling of rake and stockyard management with ship berthing: A block based evolutionary algorithm. *International Journal of Production Research*, 54(14), 4182–4204. doi: 10.1080/00207543.2015.1111535
- Babu, M., Franciosa, P., & Ceglarek, D.** (2018). Shape error modelling and analysis by conditional simulations of gaussian random fields for compliant non-ideal sheet metal parts. *Procedia CIRP*, 75, 279–284. doi: 10.1016/j.procir.2018.04.023
- Babu, M., Franciosa, P., & Ceglarek, D.** (2017). Adaptive measurement and modelling methodology for in-line 3d surface metrology scanners. *Procedia CIRP*, 60, 26. doi: 10.1016/j.procir.2017.01.009