MANU KRISHNAN, PH.D

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SUMMARY: STRATEGIC AI LEADER & SR. DATA SCIENTIST

Results-driven Sr. Data Scientist and technical leader with $7+$ years spanning predictive health monitoring, AI innovation, and academic research. Demonstrated expertise driving enterprise analytics, leading cross-functional teams, and developing production-grade AI/ML solutions to optimize complex system reliability. Adept at translating business needs into technical product strategies and driving organizational outcomes via data-driven innovation, executive collaboration, and agile project management.

Core Competencies:

- Predictive Modeling & Prognostics Algorithms
- Enterprise AI Strategy, Predictive Analytics, and ML
- Structural Health Monitoring & Diagnostics
- Cross-functional Team Leadership & Agile Project Management
- AI Agents (Google ADK, LangGraph), LLMs, Retrieval-Augmented Generation (RAG)
- Big Data Processing (Spark, Delta Lake, MLOps)
- Git Version Control and Software Product Lifecycle
- Time Series AI and IMU Sensor Data Modeling

TECHNICAL SKILLS

- **Programming:** Python, Java, R, $C++$, Matlab
- **Big Data/Cloud:** Databricks, Spark, Delta Lake, Git, MLOps workflows
- **GenAI:** LLMs, RAG, LangChain, LangGraph, Google ADK
- **Data Engineering:** SQL, workflow automation
- **Visualization/Reporting:** Power BI, Tableau, Excel, PowerPoint
- **Modeling/Test:** Ansys, Abaqus, Nastran, FEMap, Labview

WORK EXPERIENCE

Joby Aviation   **Santa Cruz, CA**
Sr. Data Scientist (Health Usage and Monitoring)   *Jan 2022 – Present*

- Spearheaded predictive health and monitoring for aviation systems using ML/AI, deploying $5+$ models for structural diagnostics and maintenance optimization.
- Led team to build AI agents (LLMs + RAG) for production fleet analysis; reduced expert workload by 40% and improved maintenance responsiveness.
- Improved data pipeline runtimes by 60%, integrating Databricks-based solutions for real-time risk detection and model validation.
- Developed and validated time-series machine learning models using IMU sensor data for vibration analysis and reliability prediction of advanced aircraft assets.
- Drove collaboration with executives/FAA for product certification and business impact; established rigorous adoption and KPI tracking.

Joby Aviation   **Santa Cruz, CA**
Propeller Integrity Intern   *May 2021 – Aug 2021*

- Developed real-time machine learning toolkits (Python/Databricks) for structural imbalance and failure detection.
- Modeled operational bearing harmonics and designed monitoring protocols deployed across critical fleet assets.
- Applied advanced feature engineering with IMU time series data for anomaly detection and vibration monitoring in propeller subsystems.

RESEARCH EXPERIENCE

Virginia Tech   **Blacksburg, VA**
Graduate Research Assistant   *Sept 2017 – Dec 2021*

- **PhD Dissertation:** Dynamic data-driven modeling of vibration in aircraft engine
  - Led PhD research on dynamic machine learning models for structural vibration and health monitoring, leveraging IMU sensor and time series data for aerospace reliability applications.
  - Developed and validated multiphysics, time series ML models; mentored undergraduate researchers and partnered with sponsors for technology transfer.
  - Produced 2 high-impact publications and filed a patent based on novel AI-driven vibration diagnostics.

Indian Institute of Technology (IIT) - Guwahati   **Guwahati, India**
Graduate research   *Jan 2016 to May 2017*

- Developed recursive PCA and AR-based real-time detection algorithms; published in leading journals.

EDUCATION

Virginia Tech   **Blacksburg, VA**
PhD (STEM) - Aerospace Engineering (Structures) - *Current GPA 3.96*   *Sept 2017 to Dec 2021*
- Elastic Stability, Advanced Aero hydrodynamics, Structural Optimization, Vehicle Structures, Dynamical systems and controls.
- **Graduate certificate in Data analytics** - Data analysis - I, Bayesian analysis, Time series analysis, Advanced Machine learning.

Indian Institute of Technology (IIT) - Guwahati   **Guwahati, India**
M. tech - Structural Engineering - GPA 4.0 (Batch topper)   *Sept 2015 to May 2017*
- Structural analysis, Structural dynamics, Finite element methods, Advanced Structural system Design, Reliability based design.

HONORS & FELLOWSHIPS

- John R. Jones III Graduate Fellowship – Virginia Tech
- Rolls Royce Fellowship – Virginia Tech / Rolls Royce
- Pratt Fellowship, Structural Engineering Batch Topper (IIT-G)

PROFESSIONAL MEMBERSHIP

- SAE HM-1 Integrated Vehicle Health Management Liaison
- Society of Experimental Mechanics (SEM)
- American Institute of Aeronautics and Astronautics (AIAA)

JOURNAL PUBLICATIONS

- **Krishnan, M**, Bhowmik, B., Hazra, B., and Pakrashi, V. (2018). Real time damage detectionusing recursive principal components and time varying auto-regressive modeling. Mechanical Systems and Signal Processing, 101:549–574.
- **Krishnan, M**, Bhowmik, B., Tiwari, A., and Hazra, B. (2017). Online damage detection using recursive principal component analysis and recursive condition indicators. Smart Materials and Structures, 26(8):085017
- Bhowmik, B.,**Manu Krishnan**, Hazra, B., and Pakrashi, V. (2019). Real-time unified single-and multi-channel structural damage detection using recursive singular spectrum analysis. Structural Health Monitoring, 18(2):563–589.
- Malladi, V.V.S., Albakri, M.I., **Krishnan, M.**, Gugercin, S. and Tarazaga, P.A. (2022). Estimating experimental dispersion curves from steady-state frequency response measurements. Mechanical Systems and Signal Processing, 164, p.108218.
- **Krishnan, M.**, Sever, I.A. and Tarazaga, P. (2022). Data-Driven Modeling of Vibrations in Turbofan Engines Under Different Operating Conditions. AIAA Journal, pp.1-15.
- **Krishnan, M.**, Malladi, V.V.S. and Tarazaga, P.A. (2022). Leveraging a data-driven approach to simulate and experimentally validate a MIMO multiphysics vibroacoustic system. Mechanical Systems and Signal Processing, 166, p.108414.
- **Krishnan, M.**, Gugercin, S., and Tarazaga, P. A. (2023). A wavelet-based dynamic mode decomposition for modeling mechanical systems from partial observations. Mechanical Systems and Signal Processing, 187, 109919.

CONFERENCE PUBLICATIONS

- Krishnan, M., Gugercin, S., Sever, I., and Tarazaga, P. (2020). Dynamic Data Driven Modeling of Aero Engine Response. In Model Validation and Uncertainty Quantification, Volume 3: Proceedings of the 38th IMAC, A Conference and Exposition on Structural Dynamics 2020 (pp. 273-278). Springer International Publishing.
- Krishnan, M., Jin, R., Sever, I. A., and Tarazaga, P. A. (2020). Data based modeling of aero engine vibration responses. In Sensors and Instrumentation, Aircraft/Aerospace, Energy Harvesting Dynamic Environments Testing, Volume 7: Proceedings of the 37th IMAC, A Conference and Exposition on Structural Dynamics 2019 (pp. 365-368). Springer International Publishing.
- Krishnan, M., Gugercin, S., and Tarazaga, P. (2021). Wavelet-based dynamic mode decomposition. PAMM, 20(S1), e202000355.
- Krishnan, M., Sever, I. A., and Tarazaga, P. A. (2020). Determining Interdependencies and Causation of Vibration in Aero Engines Using Multiscale Cross-Correlation Analysis. In Model Validation and Uncertainty Quantification, Volume 3: Proceedings of the 38th IMAC, A Conference and Exposition on Structural Dynamics 2020 (pp. 265-272). Springer International Publishing.
- Bhowmik, B., Krishnan, M., Hazra, B., and Pakrashi, V. (2017). Online damage detection using recursive principal component analysis. Procedia engineering, 199, 2108-2113.
- Davaria, S., Krishnan, M., Sriram Malladi, V. V., and Tarazaga, P. A. (2022, August). Miniature Underwater Robot–An Experimental Case Study. In Special Topics in Structural Dynamics Experimental Techniques, Volume 5: Proceedings of the 40th IMAC, A Conference and Exposition on Structural Dynamics 2022 (pp. 119-122). Cham: Springer International Publishing.

SCHOLARSHIP AND AWARDS

- John R. Jones III Graduate student Fellowship - Offered by Department of Mechanical Engineering - Virginia Tech (2020 - present)
- Rolls Royce Graduate Fellowship - Offered by Virginia Tech and Rolls Royce towards successful completion of PhD covering tuition expenses, stipend and consumables (2019 - present).
- Pratt Fellowship - Offered by Department of Aerospace and Ocean Engineering - Virginia Tech (2017-2018)
- Structural Engineering 2015-17 Batch Topper - Offered by Indian Institute of Technology, Guwahati.

PROFESSIONAL SOCIETY MEMBERSHIP

- Liaison to the SAE HM-1 Integrated Vehicle Health Management (2022 - Present)
- Society of Experimental Mechanics (2017 - Present)
- American Institute of Aeronautics and Astronautics (2017-Present)