

EDUCATION

- Ph.D. Mechanical Engineering** 2022
University of Houston, Houston, Texas
Advisor: Venkat Selvamanickam (NAE Member, NAI Fellow, IEEE Fellow)
- B.Sc. Mathematics & Physics** 2012
Tsinghua University, Beijing, China
Advisor: Zhenghe Han

PUBLICATIONS & PATENTS

- [34] A Virtual Sensor for HTS Manufacturing: Real-Time Critical Current Prediction via In-Line 2D-XRD and Machine Learning. **S. Chen**, C. Goel, M. Paidpilli, Y. Li, V. Selvamanickam. *in review*. 2026.
- [33] Continuous Electromagnetic Characterization System for Long Length High-Temperature Superconductors at Low Temperature in High Background Magnetic Fields. **S. Chen**, Y. Zhai, P. Bunkowski. *PCT/US2025/022536 in review*. 2025.
- [32] Challenges in Continuous In-Field Critical Current Testing of High-Temperature Superconducting Tapes: Thermal and Mechanical Perspectives. **S. Chen**, G. Bradford, P. Bunkowski, R. Kapinos, J. Cruz, Y. Zhai. *IEEE Trans. Appl. Supercond.* 2025.
- [31] Advancing Reel-to-Reel Inspection Techniques for Long HTS Conductors: Comparison and Innovations. **S. Chen**, Y. Li, C. Goel, P. Bunkowski, J. Dye, L. Zhu, J. Rong, Y. Zhai, V. Selvamanickam. *IEEE Trans. Appl. Supercond.* 2025.
- [30] On the Development of Compact HTS Coil Modules for Large Bore High Field Superconducting Magnets. Y. Zhai, J. Menard, A. Yazdani, N. Ong, J. Barkas, B. Berlinger, P. Bunkowski, **S. Chen**, Y. Li, R. Matthiessen, J. Dye. *IEEE Trans. Appl. Supercond.* 2025.
- [29] Current Sharing and Mechanical Properties of Slot-n-Fill REBCO Tapes. S. Xue, L. Zhu, J. Rong, N. Mai, Y. Li, **S. Chen**, U. Sambangi, J. Peram, V. Selvamanickam. *IEEE Trans. Appl. Supercond.* 2025.
- [28] Suppressing Screening-Current-Induced Strain in a 72-Mm-Bore REBCO Insert for a 20-T Magnet: A Numerical Study. Y. Li, **S. Chen**, J. Dye, P. Bunkowski, B. Berlinger, R. Matthiessen, Y. Zhai. *IEEE Trans. Appl. Supercond.* 2025.
- [27] Metal-Insulation REBCO Pancake Coil with Solder Surface Shunt: Testing and Modeling. Y. Li, **S. Chen**, F. Dong, J. Dye, Y. Yan, C. Gao, Y. Zhai, D. Park. *IEEE Trans. Appl. Supercond.* 2025.
- [26] Correlations Between In-Line X-Ray Diffraction Data and In-Field Critical Current of Long, 4- μm -Thick Film REBCO Tapes Made by Advanced MOCVD. C. Goel, M. Paidpilli, **S. Chen**, Y. Li, M. Oad, L. Zhu, G. Majkic, V. Selvamanickam. *IEEE Trans. Appl. Supercond.* 2025.
- [25] Current Sharing in Double-Sided REBCO Tapes. S. Xue, Y. Li, L. Zhu, B. Sarangi, J. Sandra, J. Rong, N. Mai, **S. Chen**, A. Chavda, U. Sambangi, J. Peram, P. Parthiban, V. Selvamanickam. *Supercond. Sci. Technol.* 2024.
- [24] A Novel Roughness-Based Metric for Uniformity Modeling and Monitoring in High-Temperature Superconductor Manufacturing. Y. Xiang, K. Adhikari, Y. Lin, Q. Feng, **S. Chen**, M. Paidpilli, C. Goel, V. Selvamanickam. *IISE Annu. Conf. Proc.* 2024.

- [23] Autoregressive Distributed Lag-Based Dynamic Uniformity Modeling and Monitoring Approaches for Superconductor Manufacturing. S. Peng, M. Li, Y. Lin, Q. Feng, W. Fu, **S. Chen**, M. Paidpilli, C. Goel, E. Galstyan, V. Selvamanickam. *International Journal of Computer Integrated Manufacturing*. 2024.
- [22] 40-Meter-Long REBCO Tapes with Critical Current over 4,000 A/12 Mm at 4.2 K and 13 T by Advanced MOCVD. M. Paidpilli, C. Goel, B. Sarangi, **S. Chen**, E. Galstyan, J. Jaroszynski, G. Bradford, D. Abraimov, V. Selvamanickam. *Superconductivity*. 2024.
- [21] REBCO Insert Coils Toward High-Field, Large-Bore Magnet for Quantum Physics Research. Y. Li, **S. Chen**, Y. Yan, B. Berlinger, R. Matthiessen, Y. Zhai. *IEEE Trans. Appl. Supercond.* 2024.
- [20] Quantile Regression-Enriched Event Modeling Framework for Dropout Analysis in High-Temperature Superconductor Manufacturing. M. Li, Y. Lin, Q. Feng, W. Fu, S. Peng, **S. Chen**, M. Paidpilli, C. Goel, E. Galstyan, V. Selvamanickam. *J Intell Manuf.* 2024.
- [19] GIFR: A Graph-Informed Functional Regression Model for Process-StructureProperty Relationships Discovery. K. Adhikari, Y. Xiang, Y. Lin, Q. Feng, **S. Chen**, M. Paidpilli, C. Goel, V. Selvamanickam. *IISE Annu. Conf. Proc.* 2024.
- [18] Development of 50-Meter RE-Ba-Cu-O Tapes with Critical Current Over 1750 A/12mm at 65 K, 0.25 T by Advanced-MOCVD. M. Paidpilli, C. Goel, **S. Chen**, Y. Li, R. Jain, V. Shyam, M. Oad, V. Yerraguravagari, E. Galstyan, G. Majkic, R. Schmidt, C. Rey, T. Carnes, V. Selvamanickam. *IEEE Trans. Appl. Supercond.* 2023.
- [17] High Critical Current STAR Wires with REBCO Tapes by Advanced MOCVD. E. Galstyan, J. Kadiyala, M. Paidpilli, C. Goel, J. Sandra, V. Yerraguravagari, G. Majkic, R. Jain, **S. Chen**, Y. Li, R. Schmidt, J. Jaroszynski, G. Bradford, D. Abraimov, X. Chaud, J. Song, V. Selvamanickam. *Supercond. Sci. Technol.* 2023.
- [16] Reinforcement Learning for Real-Time Process Control in High-Temperature Superconductor Manufacturing. Q. Feng, S. Peng, Y. Lin, **S. Chen**, M. Paidpilli, C. Goel, E. Galstyan, V. Selvamanickam. *Int J Adv Manuf Technol.* 2023.
- [15] Dynamic Uniformity Modeling in Superconductor Manufacturing via Vector Autoregression Analysis. S. Peng, M. Li, Y. Lin, Q. Feng, W. Fu, E. Galstyan, **S. Chen**, R. Jain. *IISE Annu. Conf. Proc.* 2022.
- [14] A Spatial Point Process-Based Approach for Dropout Events Modeling in HighTemperature Superconductor Manufacturing. M. Li, S. Peng, Y. Lin, Q. Feng, W. Fu, E. Galstyan, **S. Chen**, R. Jain. *IISE Annu. Conf. Proc.* 2022.
- [13] A Reel-to-Reel Scanning Hall Probe Microscope for Characterizing Long REBCO Conductor in Magnetic Fields Up to 5 Tesla. Y. Li, **S. Chen**, M. Paidpilli, R. Jain, C. Goel, V. Selvamanickam. *IEEE Trans. Appl. Supercond.* 2022.
- [12] Scale Up of High-Performance REBCO Tapes in a Pilot-Scale Advanced MOCVD Tool With In-Line 2D-XRD System. **S. Chen**, G. Majkic, R. Jain, R. Pratap, V. Mohan, C. Goel, V. Selvamanickam. *IEEE Trans. Appl. Supercond.* 2021.
- [11] Magnetization and Screening Current in an 800 MHz (18.8 T) REBCO Nuclear Magnetic Resonance Insert Magnet: Experimental Results and Numerical Analysis. Y. Li, D. Park, Y. Yan, Y. Choi, J. Lee, P. Michael, **S. Chen**, T. Qu, J. Bascunan, Y. Iwasa. *Supercond. Sci. Technol.* 2019.
- [10] Characterization of Ic Degradation in Bent YBCO Tapes. L. Lai, C. Gu, Y. Yue, **S. Chen**, M. Song, N. Hu, T. Qu, S. Zou. *IEEE Trans. Appl. Supercond.* 2019.
- [9] Open Magnetic Shielding by Superconducting Technology. C. Gu, L. Lai, **S. Chen**, T. Qu, Y. Yue. *IEEE Trans. Appl. Supercond.* 2019.

- [8] Reel-to-Reel Scanning Hall Probe Microscope Measurement on REBCO Tapes. **S. Chen**, X. Li, W. Luo, V. Selvamanickam. *IEEE Trans. Appl. Supercond.* 2019.
- [7] Inductance of Low-Frequency Small-Scale High-Temperature Superconducting Coils. **S. Chen**, C. Gu, Y. Li, L. Lai, T. Qu, N. Hu, M. Song, S. Zou, Y. Yue. *IEEE Trans. Appl. Supercond.* 2019.
- [6] Magnetic Field Shielding System Based on Closed Superconducting Coil Groups and Magnetic Field Shielding Device. C. Gu, **S. Chen**, T. Qu, Z. Han. *Patent US10015917B2*. 2018.
- [5] Magnetic Field Shielding System and Magnetic Shielding Device Based on Closure Superconducting Coil Group. C. Gu, **S. Chen**, T. Qu, Z. Han. *Patent CN104349653B*. 2018.
- [4] Based on the Magnetic Field Shielding System and Magnetic Shielding Device for Being Closed Superconducting Coil Group. C. Gu, T. Qu, **S. Chen**, Z. Han. *Patent CN104349654B*. 2018.
- [3] Experimental Realization of Open Magnetic Shielding. C. Gu, **S. Chen**, T. Pang, T. Qu. *Appl. Phys. Lett.* 2017.
- [2] Observation and Analysis of Defects in Impregnated YBCO Racetrack Coil. **S. Chen**, C. Gu, T. Qu, L. Lai, N. Hu, Y. Jiang. *IEEE Trans. Appl. Supercond.* 2017.
- [1] Examination and Analysis of Critical Current Uniformity of Long HTS Tapes by the MCOrder. S. Zou, C. Gu, T. Qu, **S. Chen**, X. Li, Z. Han. *IEEE Trans. Appl. Supercond.* 2015.

TECHNICAL PRESENTATIONS

- Oct 22, 2025 **[Oral/Invited/Featured] Superconductivity in Nuclear Fusion**
Celebrate Princeton Innovation 2025, Princeton, NJ
- Jul 02, 2025 **[Poster/Invited] Development of a Continuous Characterization System for High-Temperature Superconductors: Advancing In-Field Quality Assurance for High-Field Applications**
2025 International Conference on Magnet Technology, Boston, MA
- Sep 06, 2024 **[Oral] Reel-to-Reel Continuous Characterization of Long REBCO Conductors Towards Full-Cycle Quality Control of REBCO Conductors and Magnets**
Applied Superconductivity Conference 2024, Salt Lake City, UT
- Sep 04, 2024 **[Oral] Comparative Study in Reel-to-Reel Continuous Characterization of Long REBCO Conductors at 65-77 K in Self- and Background Fields**
Applied Superconductivity Conference 2024, Salt Lake City, UT
- Apr 03, 2024 **[Poster/Invited] Roadmap for Continuous Characterization of Long Coated Conductors for High-Field Applications**
Low Temperature Superconductor Workshop, Seaside, CA
- Aug 23, 2023 **[Oral] Trap Everything like Magneto**
PPPL Research SLAM, Princeton, NJ
- May 05, 2023 **[Oral] Enabling Compact Fusion by High-Temperature Superconductor**
Princeton Research Day 2023, Princeton, NJ
- Apr 05, 2023 **[Poster/Best Poster] Quality Assessment of Long REBCO Coated Conductors by Offline/Inline Characterization Techniques Augmented by Machine-Learning Models**

International Workshop on Coated Conductors for Applications, Houston, TX

Oct 27, 2022 **[Oral] Machine Learning-Based In-line Prediction of In-field/Self-field Critical Current of Long REBCO Conductors based on Real-time Two-Dimensional X-ray Diffraction during Manufacturing**

Applied Superconductivity Conference 2022, Honolulu, HI

Dec 02, 2021 **[Oral/Best Oral Presentation] A Conjunctive Approach of Reel-to-Reel Characterization of Long REBCO Conductor - Data Fusion of In-field/Self-field Ic & In-line 2D-XRD**

The 34th International Symposium on Superconductivity, Virtual

Oct 28, 2020 **[Poster] Scale up of high-performance REBCO tapes in a pilot-scale Advanced MOCVD tool with in-line 2D-XRD system**

Applied Superconductivity Conference 2020, Tampa, FL

Oct 30, 2018 **[Poster] Reel-to-reel Critical Current Testing of High Performance REBCO Tapes**

Applied Superconductivity Conference 2018, Seattle, WA

Oct 31, 2018 **[Poster] Inductance of High Temperature Superconducting Coils**

Applied Superconductivity Conference 2018, Seattle, WA

Jun 09, 2015 **[Oral] Magnetic Shielding System by Superconducting Coils**

2015 China Conference on Electromagnetic Compatibility, Beijing, China

PROFESSIONAL EXPERIENCE

2023 - Present **Princeton Plasma Physics Laboratory / Princeton University, Princeton, NJ**

Strategic Science Initiative Postdoc / Associate Research Physicist

- Commissioned new magnet user facilities at PPPL, expanding foundational research capabilities in extreme environments for international academic and industrial collaborators.
- Innovate advanced high-temperature superconducting (HTS) magnet technologies, applying advanced computational toolkits from plasma physics to optimize component design, significantly reducing projected construction costs and technical risks for next-generation fusion devices.
- Direct the full-cycle prototyping of HTS magnets, integrating fundamental physical modeling, fabrication, and performance testing to substantially improve the stability and operational efficiency of magnet systems.

2017-2022 **University of Houston, Houston, TX**

Graduate Research Assistant

- Directed the end-to-end development and growth of 50-meter-class high-temperature superconductors, achieving world-record critical current performance and directly advancing the frontier of high-field magnet materials.
- Pioneered a physics-informed AI/ML framework for superconductor manufacturing, reducing R&D iteration cycles from days to minutes through real-time data fusion and predictive quality feedback.

- Designed and constructed a suite of closed-loop online/offline continuous measurement devices, filling a critical technological gap in the high-precision dynamic characterization of long HTS tapes.

2015 - 2016 **Eastforce Superconducting Technology Co., Ltd., Beijing, China**

Founding Scientist / R&D Manager

- Led the translational research and technology transfer of five novel superconducting characterization instruments, overseeing the progression from fundamental physics concepts to deployment-ready diagnostic tools.
- Spearheaded the design and implementation of advanced laboratory infrastructure, establishing rigorous experimental protocols and technical standards that ensured high-fidelity data and reproducible results across the research-to-application pipeline.
- Architected long-term R&D and intellectual property strategies, securing the institution's technical leadership by converting proactive scientific research into a robust portfolio of patents and proprietary methodologies.

2014 **Tsinghua University, Beijing, China**

Research Assistant

- Invented and operationalized a novel passive magnetic shielding technique (Granted Patents: US10015917B2, CN104349653B, CN104349654B), resolving magnetic interference bottlenecks for high-precision physics/medical experiments.
- Developed a liquid nitrogen temperature self-field critical current continuous measurement system, significantly increasing the high-throughput characterization rate of long HTS tapes; this system was cited by national group standards and is widely adopted internationally.

2012 - 2013 **Innova Superconductor Technology Co., Ltd., Beijing, China**

Technical Consultant

- Designed and deployed automated process control systems for the 1st-generation HTS (BSCCO/Bi-2223) material fabrication.
- Implemented real-time monitoring solutions for heat treatment processes and reel-to-reel tape geometry, improving material consistency and strengthening quality control.

2011 - 2012 **Intel Labs China, Beijing, China**

Intern

- Raised and implemented a cross-device process migration scheme on a multi-core ARM platform, providing key technical support for mobile distributed computing. The results have been applied to subsequent basic research projects.

TEACHING

Summer 2023 Lecturer, Princeton Plasma Physics Laboratory Graduate Summer School for Fusion Engineering - Superconducting Materials for Fusion

MENTORING

2025 Robert Kapinos, Engineering Internship (PPPL)
 2025 John Cruz, Engineering Apprenticeship (PPPL)

- 2024 Michael Alusik, Engineering Apprenticeship (PPPL)
- 2023 - 2024 Piotr Bunkowski, B.E. Mechanical Engineering (PPPL SULI '23 / TCNJ '24)
- Summer 2023 Maxanthony Mateer, B.E. Mechanical Engineering (PPPL SULI '23 / Georgia Tech '25)
- 2021 - 2022 Nathan Touchet, B.E. Electrical and Electronics Engineering (Univ of Houston '25)
- 2021 Naman Mehndiratta, High School Senior / Research Intern (TAMS at UNT '21)

SERVICES

- Grant Reviewing DOE Small Business Innovation Research (SBIR) Program
- Journal Reviewing Superconductivity, SUST, IEEE-TAS, IEEE-TIE, IEEE-TMAG, JAEM, EPJ, JMIR Medical Informatics
- Conference Reviewing ASC, MT, EUCAS
- 2025 - 2026 Board Member; Sponsorship Co-Chair; Material Program Committee Member *Applied Superconductivity Conference 2026*
- 2023 - 2024 Board Member; Sponsorship Co-Chair; Material Program Committee Member *Applied Superconductivity Conference 2024*
- 2022 - 2023 Program Committee Member *International Workshop on Coated Conductor for Applications 2023*
- March 2023 Program Committee Member *Fusion Magnet Community Workshop*
- 2021 - 2022 Board Member; Material Program Committee Member; ELEVATE Program Committee Member *Applied Superconductivity Conference 2022*
- 2020 - 2021 ELEVATE Program Founding Committee Member *Applied Superconductivity Conference 2020*

AWARDS & HONORS

- 2025 IEEE Transactions on Applied Superconductivity Distinguished Reviewer Award
- 2023 DOE CABLE Conductor Manufacturing Prize Stage 2 Winners (Team)
- 2023 International Workshop on Coated Conductors for Applications 2023 Best Poster Prize
- 2021 DOE CABLE Conductor Manufacturing Prize Stage 1 Winners (Team)
- 2021 International Symposium on Superconductivity 2021 Encouragement Award (Best Oral Presentation)
- 2020 TeSUH Cora Hawley Scholarship
- 2019 American Bureau of Shipping Scholarship
- 2017 Houston Endowment Fellowship
- 2017 University of Houston Presidential Fellowship
- 2017 Third Best Invention Prize, China Electric Power Sci & Tech Award (Team)
- 2017 Third Prize, Yunnan Province (China) Technological Invention Award (Team)

