

Noah Salk

4540 N. Bernard St.
Chicago, IL 60625

noahsalk.github.io

Email: nsalk@mit.edu
Cell: (847) 867-9108

EDUCATION

Massachusetts Institute of Technology , Cambridge, MA, PhD, Electrical Engineering (MathWorks Fellow) Advisor: Dr. Chathan Cooke	Expected May 2024 <u>Research Area</u> : High Power Electromagnetics <u>GPA: 4.90/5.00</u>
Massachusetts Institute of Technology , Cambridge, MA, SM, Electrical Engineering (Landsman Fellow, MathWorks Fellow) Advisor: Dr. Chathan Cooke Thesis: Design Methodology for an Ultra-High Efficiency Coreless Resonant Power Transformer	May 2022 <u>Research Area</u> : High Power Electromagnetics <u>GPA: 4.80/5.00</u>
University of Illinois at Urbana-Champaign , Urbana, IL, BS, Electrical Engineering	May 2020 <u>GPA: 3.98/4.00</u>

Awards: 2x MathWorks Fellowship; Landsman EE Fellowship; Robert C. MacClinchie Scholarship; Grainger Power Engineering; IEEE PES Scholarship; 2x Jules D. Falzer Memorial; Edward C. Jordan; Russell E. Berthold; Bronze Tablet

Study Abroad: National University of Singapore

Fall 2018 Semester

EXPERIENCE

Massachusetts Institute of Technology , Cambridge, MA, <i>Graduate Research Assistant</i>	September 2020-Present
<ul style="list-style-type: none">AC loss reduction for a high efficiency, 40 kW air-core resonant power transformer (ProlecGE)Developed a versatile simulation-assisted layered mesh approach to modeling Litz wire in arbitrary configurationsCreated a high accuracy, fast analytical method for estimating losses in air-core, multi-phase coil systemsImplemented a genetic-algorithm-based optimization for generating maximum efficiency designs of a class of coreless transformers with flux-guiding resonant coils, given desired power, frequency, input voltage, and voltage ratio.	
Hinetics LLC , Champaign, IL, <i>Director of Advanced Technologies</i>	January 2020-Present
<ul style="list-style-type: none">Proposed, negotiated, and secured more than \$10m of small business research grantsManaging technical tasks and project deliverables for the largest award in ARPA-E's OPEN 2021 solicitation to develop a 10 MW partially superconducting motor for aircraft propulsion: achieving the world's highest specific powerManaged a NASA Phase II SBIR project to manufacture and demonstrate a prototype motor for aircraft propulsionLeads transient electrical and thermal system modeling efforts for eVTOL load profile optimization (Air Force STTR)Wrote a successful NASA Phase I SBIR grant for a magnetics-embedded insulation and cooling architecture, PMDeveloped a pole-pair test for an offshore wind turbine's actively shielded superconducting field coils (NSF Phase II)Designed a new coil mold for form-wound air-core windings with cured resin	
Ford Motor Company , Chicago, IL, <i>Power Electronics R&D Intern</i>	June-August 2020
<ul style="list-style-type: none">Compared Wide Band Gap (WBG) Semiconductors with conventional Silicon IGBTs for traction inverter applicationsDeveloped a GUI to visualize performance over various operating biases and temperatures. This includes calculating parameters of interest from test data collected on power modules in Ford's inventory.	
Haran Research Group , Urbana, IL, <i>Research Assistant</i>	April 2019-May 2020
<ul style="list-style-type: none">Performed multi-objective optimization for the design of superconducting machines for electric aircraft and wind turbine applications; preliminary work for NASA's LH₂, fuel-cell powered commercial aircraft concept (CHEETA)Carried out EM FEA for a test rotor to measure ac losses in superconducting coilsAided in the development and application of ac loss models for superconducting machine windingsCreated a 3D model to demonstrate the machine topology for a Pareto-optimal design	
Naval Surface Warfare Center , Crane, IN, <i>SSEP Electrical Engineering Intern</i>	May-August 2018
<ul style="list-style-type: none">Performed cybersecurity research on vulnerabilities in the Ohio-class submarine's air-gapped fire control systemsDetected and visualized a Funtenna based side-channel emanating from a monitor using an SDRDemonstrated practicality of parallel spectrum scanning for side-channel supervision and automatic detection with DSPCompleted a project quoted for \$250,000 using a \$20 commercial SDR	

PROJECTS AND LEADERSHIP EXPERIENCE

Illini Air Shuttle, President and Co-founder

September 2019-May 2020

- Founded an RSO to develop an electric VTOL air shuttle concept for transportation between Champaign, IL and Chicago, IL; presented at AIAA EATS 2019
- Modeled a power system for safety analysis; includes dq motor control, power electronics, and machine parameters
- Developed an optimization scheme for aircraft design considering mission profile and weight estimations

CAMPUS INVOLVEMENT

Power and Energy Conference at Illinois (PECI), UIUC, Corporate Relations Co-chair

August 2019-May 2020

Eta Kappa Nu (HKN) Alpha Chapter, UIUC, Active Member

January 2018-May 2020

ADDITIONAL EXPERIENCE

Electrical and Computer Engineering Department, Champaign, IL, ECE 385 UA

August 2019-May 2020

Electrical and Computer Engineering Department, Champaign, IL, ECE 210 Course Grader

January-May 2019

University of Illinois Foundation, Champaign, IL, Research and Portfolio Management

October 2017-May 2018

SPECIALIZED SKILLS

Programs: MATLAB, FEMM, COMSOL, Altair Flux, LTSpice, KiCad, Simulink, Autodesk Inventor, GOSSET

Languages: Mandarin (Conversational; “Intermediate”)

JOURNAL PUBLICATIONS AND CONFERENCE PAPERS

- N. J. Salk and C .M. Cooke, “Calculation of AC Losses in Multi-phase Litz Coil Systems,” in *2022 IEEE Transportation Electrification Conference & Expo (ITEC)*, 2022.
- S. Sirimanna, T. Balachandran, N. Salk, J. Xiao, and K. S. Haran, “Electric Propulsors for Zero-Emission Aircraft: Partially superconducting machines,” in *IEEE Electrification Magazine*, 2022.
- D. Lee, T. Balachandran, S. Sirimanna, N. Salk, A. Yoon, P. Xiao, J. Macks, Y. Yu, S. Lin, J. Schuh, P. Powell, and K. S. Haran, “Detailed Design and Prototyping of a High Power Density Slotless PMSM,” in *IEEE Transactions on Industry Applications*, 2022.
- T. Balachandran, N. J. Salk, D. Lee, M. D. Sumption, and K. S. Haran, “Methods of Estimating AC Losses in Superconducting MgB₂ Armature Windings with Spatial and Time Harmonics,” in *IEEE Transactions on Applied Superconductivity*, 2022.
- N. J. Salk and C. M. Cooke, “A Versatile Simulation-Assisted Layered Mesh Analysis for Generalized Litz Wire Performance,” in *IEEE Transactions on Magnetics*, vol. 58, no. 6, pp. 1-8, June 2022.
- D. Lee *et al.*, “Design and Prototype of a High Power Density Slotless PMSM for Direct Drive Aircraft Propulsion,” *2021 IEEE Power and Energy Conference at Illinois (PECI)*, 2021
- T. Balachandran, D. Lee, N. Salk, J. Xiao, and K. S. Haran, “Evaluation and Mitigation of AC Losses in a Fully Superconducting Machine for Wind Turbine Applications,” in *IEEE Transactions on Applied Superconductivity*, vol. 30, no. 4, pp. 1-5, June 2020
- T. Balachandran, D. Lee, N. J. Salk, and K. S. Haran, “A fully superconducting air-core machine for aircraft propulsion,” *IOP Conference Series: Materials Science and Engineering, Advances in Cryogenic Engineering: Proceedings of the Cryogenic Engineering Conference (CEC) 2019*, June 2020
- J. Xiao, N. Salk and K. Haran, “Conceptual Design of an eVTOL Air Shuttle for Rapid Intercity Transport,” *2020 IEEE Power and Energy Conference at Illinois (PECI)*, Champaign, IL, USA, 2020, pp. 1-8

PATENTS

- (Pending) N. Salk, T. Balachandran, K. Haran, D. Lee, and P. Powell, “Slotless Electric Motor Having Improved Cooling,” *US Patent App. 17/661,819*.