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Engineering & Scientific Consulting

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Professional Profile

Dr. Sinenian has expertise in the fields of applied physics, electrical engineering & computer science and nuclear engineering. He has advised corporate leadership and management on business and technical matters in the automotive, consumer electronics, defense, and medical device industries in the United States, Asia and Australia.

Dr. Sinenian has also served as an advisory technical expert to assist clients engaged in disputes in the United States and around the world. He has experience advising clients in matters pertaining to intellectual property, trade secrets, product liability, US ITC investigations, and global disputes (international arbitration), including certain technical aspects of large capital projects involving energy, oil & gas, mining, and transportation.

Dr. Sinenian has experience in the analysis and design of circuits and systems for a wide range of applications, including control systems and instrumentation, power converters, and radio-frequency systems. He has conducted investigations and design reviews of electronic systems to assist clients during product development, to conduct failure analysis, and in various litigation contexts.

Dr. Sinenian also has extensive experience in machine learning, data analytics and algorithm development and analysis. He has experience applying clustering, regression and deep-learning techniques to large datasets to draw actionable insights and for predictive modeling applications. He has analyzed dynamic control algorithms in embedded systems and products in the context of failure analysis and assisted clients with software and signal processing related matters in trade secret and intellectual property litigation. He is proficient in numerous languages, including C, C++, Java and Python. Dr. Sinenian is actively involved open-source software development and is the co-author of a book on data structures and algorithms.

Dr. Sinenian has research experience in the area of plasma physics and its applications in propulsion and fusion. In his earlier studies, he designed and built a novel compact radio-frequency driven plasma thruster for small satellite applications. As part of this work, he built plasma diagnostics and used them to characterize the performance of the thruster with argon and nitrogen propellants. During this time, he was employed as an Associate at Ad Astra Rocket Company, where he designed electrical systems, including radio-frequency circuits and power management systems for electric propulsion applications.

In his doctoral research, Dr. Sinenian built nuclear instrumentation and used it to study aspects of laser inertial fusion in support of the national laser fusion program. As part of this work, he led a team that built an ion accelerator laboratory and used it to develop and calibrate nuclear instruments for use on the OMEGA and the National Ignition Facility laser systems. Dr. Sinenian's dissertation focused on using measurements of fast ions produced in inertial fusion experiments to diagnose the performance of fusion implosions.

Academic Credentials & Professional Honors

Ph.D., Nuclear Science and Engineering, Massachusetts Institute of Technology (MIT), 2013

M.S., Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT), 2008

M.S., Nuclear Science and Engineering, Massachusetts Institute of Technology (MIT), 2008

B.S., Physics, University of California, San Diego, 2005

UCSD Physics Best Project (Winter 2005): GPS-navigated Autonomous Rover

UCSD Marshall College Provost's Honors

Licenses and Certifications

PADI Certified Open Water Scuba Diver

Udacity Certified ML Engineer

Languages

Armenian

Publications

Klopp, R, Martens, J, and Sinenian, N. Today's Complex Mining and Minerals Disputes Favor Breadth Over Depth in Expertise, Mining Arbitration Report, Jus Mundi, March 2022.

Zhang, Q, Sinenian, N, and Huang, R. Investigations on Electrolytic Capacitors to Improve Reliability under Assembly-Level Impact Conditions; IEEE International Conference on (ICEPT) Electronic Packaging Technology, 2019.

Sinenian, N. and Shai, D., Chapter 3: Advances in Power Converters. D'Andrade Brian W. (Editor), The Power Grid: Smart, Secure, Green and Reliable. Book, ISBN 978-0-12-805321-8, 2017.

Jagannathan S, Sinenian N. Algorithms and data structures in Python. ISBN: 9781502378712. 2014.

Sinenian N, Manuel M J-E, Frenje, JA, et al. An empirical target discharging model relevant to hot-electron preheat in direct-drive implosions on OMEGA. Plasma Physics and Controlled Fusion 2013; 55(4).

Sinenian N, Zylstra AB, Manuel M, et al. A multithreaded modular software toolkit for control of complex experiments. Computing in Science and Engineering 2013; 15(1):65.

Sinenian N, Theobald W, Frenje JA, et al. Proton emission from cone-in-shell fast-ignition experiments at Omega. Physics of Plasmas 2012; 19(11):112,708.

Sinenian N, Fiksel G, Frenje JA, et al. Heavy-ion emission from short-pulse laser-plasma interactions with thin foils. Physics of Plasmas 2012; 19(9):093,118.

Sinenian N, Zylstra AB, Manuel MJ-E, et al. Total energy loss to fast ablator-ions and target capacitance of direct-drive implosions on OMEGA. Applied Physics Letters 2012; 101(11):114,102.

Sinenian N, Manuel MJ-E, Zylstra AB, et al. Upgrade of the MIT Linear Electrostatic Ion Accelerator

(LEIA) for nuclear diagnostics development for Omega, Z, and the NIF. Review of Scientific Instruments 2012; 83(4):043502.

Sinenian N, Rosenberg MJ, Manuel M, et al. The response of CR-39 nuclear track detector to 1-9 MeV protons. Review of Scientific Instruments 2011; 82(10).

Presentations

Sinenian N. Watts in Arbitration? The Development of Energy Arbitration. AIAC Asia ADR Week 2021, Asian International Arbitration Centre (Defects in Solar PV and Wind Installations), August 29-21, Kuala Lumpur, Malaysia.

Sinenian N. An empirical target discharging model for direct-drive implosions on OMEGA. 54th Annual Meeting of the APS Division of Plasma Physics, Providence, RI, November 2, 2012.

Sinenian N. Measurements of deuteron ablator-ion energy spectra for studies of energy-loss and preheat in direct-drive implosions on OMEGA. Doctoral Seminar at the Plasma Science & Fusion Center, MIT, Cambridge, MA, December 13, 2011.

Sinenian N. Measurements of the ablator-ion energy-loss channel in direct-drive implosions on OMEGA. 53rd Annual Meeting of the APS Division of Plasma Physics, Salt Lake City, UT, November 14, 2011.

Sinenian N. Implementation of a Thomson Parabola for improved fast-ion measurements and nuclear physics studies. Laboratory for Laser Energetics Theory Group Meeting, Rochester, NY, September 27, 2011.

Sinenian N. Observations of energetic protons in recent integrated fast-ignition experiments at the OMEGA Laser Facility. Doctoral Seminar at the Plasma Science & Fusion Center, MIT, Cambridge, MA, November 11, 2010.

Sinenian N. The role of nuclear particles at OMEGA, OMEGA EP, and the NIF. Doctoral Seminar at the Plasma Science & Fusion Center, MIT, Cambridge, MA, October 28, 2009.

Project Experience

Aerospace & Defense - Ejection Seats: Design review of ejection seat control system (logic and circuitry) for defense applications.

Aerospace & Defense - Radar System: Design review and comparison of two competing military-grade RF systems, including transceivers and aspects of embedded algorithms.

Automotive - Airbag Controller: Root-cause analysis of defective capacitors used in embedded controllers to manage vehicle airbags.

Automotive - Brake controller: Analysis of aftermarket brake controllers for towed vehicles for infringement of a US patent, including review of software and circuitry.

Automotive - Usage-based Insurance Device: Investigation of aftermarket automotive hardware device (circuitry) used for usage-based insurance to assess potential for interference with vehicle functions.

Automotive - Usage-based Insurance Device: Investigation of aftermarket automotive hardware device (circuitry) used for usage-based insurance to assess potential for interference with vehicle functions

Consumer Electronics - Capacitive Sensors: Design review and advice on developing capacitive sensors for fluid level detection for a new product, including modeling and testing of sensors and circuitry.

Consumer Electronics - eScooters: Root cause analysis of embedded control algorithms for mobility device in the context of high-profile failures worldwide; led investigation, advised CTO and management on course of action.

Consumer Electronics - Integrated Circuit: Analysis of flash memory chip semiconductor structure and comparison against patents for to assess infringement for an ITC investigation.

Consumer Electronics - Integrated Circuit: Design evaluation and analysis of differential voltage amplifiers for an ITC investigation.

Consumer Electronics - Integrated Circuit: Failure investigation of a switching integrated circuit utilized in an radio-frequency system component.

Consumer Electronics - Integrated Circuit: Root cause analysis of failures in DRAM ICs used in mass-produced mobile phones.

Consumer Electronics - Integrated Circuit: Testing and analysis of spintronic-based GMR isolators for infringement of certain patent claims for a US district court case.

Consumer Electronics - Microwave Oven: Investigated failures of household microwave oven circuitry as part of a class-action lawsuit, review of hardware design, embedded source code.

Consumer Electronics - Mobile Device: Design evaluation of miniature electro-mechanical actuators using a laser-doppler vibrometer.

Consumer Electronics - Mobile Device: Identified Android kernel source code and re-compiled custom kernel to demonstrate certain functionality that infringed on a US patent.

Consumer Electronics - Printed Circuit Boards: Fault isolation and root cause analysis of failures in main logic boards used in a consumer electronic device.

Consumer Electronics - Smart Lighting: Die-level reverse engineering of integrated circuits in lighting products designed for power, control and safety management for a patent infringement suit.

Consumer Electronics - Washing Machine: Investigated failures of washing machine control system circuitry as part of a class-action lawsuit.

Consumer Electronics - Wearable: Design review of iOS and Android apps developed for a fitness tracking device.

Consumer Electronics - Wearable: Detailed ray-optics modeling for a new wearable product incorporating lenses, micro LEDs and sensors.

Consumer Electronics - Wearable: Investigated source code and evaluated hardware performance of certain wearable electronic devices to determine causes of alleged excess battery drain.

Energy, Oil & Gas - Hydroelectric Power Plant: Evaluation of installed protection systems for plant-to-grid interconnection.

Energy, Oil & Gas - Pipeline: Investigation of progression of control system design for a gas pipeline in Central Asia. Assessment of compliance with requisite industry standards.

Energy, Oil & Gas - Power Plant - Latin America: Investigation and root-cause analysis of defective high-

voltage motors in connection with a coal-fired power plant in Brazil.

Energy, Oil & Gas - Refinery in Southeast Asia: Assessment of a wide range of electrical defects, including electrical machinery, UPS systems, switchgear. Analysis of Plant control system architecture and feasibility of changeovers mid-construction.

Energy, Oil & Gas - Solar PV Plant: Root-cause analysis of incident involving heat damage to a Solar PV inverter. Investigation of environmental factors, power electronics and interconnections (junctions and cabling).

Industrial Processing - Fertilizer Plant: Assessed design and suitability of aspects of electrical systems and electronics of a fertilizer plant in Southeast Asia in view of the project's technical requirements.

Industrial Processing - Food & Beverage: Assessment of Enterprise Resource Planning (ERP) system implementation.

Industrial Processing - Iron Ore Processing Plant: Assessment of defective works in connection with the construction of an iron-ore processing plant in Asia.

Industrial Processing - Mining Facility: Assessment of degree of electrical modularisation of supplied machinery, defective works in connection with electrical switchgear and terminations.

Industrial Processing - Smelting Plant: Assessment of power quality and potential associated defective works in connection with a smelting Plant in Central Asia.

Manufacturing - Batteries: Developed software systems (database, data APIs and dashboards) and applied PCA and clustering algorithms to battery manufacturing audit data to identify lots with a higher propensity of failure.

Manufacturing - Electromechanical Actuator: Developed semi-automated image processing techniques to assess dimensional similarity of miniaturized components in a linear actuator.

Medical Device - AC-DC Adapter: Design evaluation of a power adapter for medical device applications.

Medical Device - Battery: Root cause analysis of field failures of a battery management unit used to sense voltage, current and temperature of cells.

Medical Device - CPAP: Failure investigation of control electronics associated with a medical device.

Medical Device - DC-DC Power Converter: Failure investigation of a DC-DC power converter for a medical device.

Medical Device - Fluid Management: Design review of control algorithms for a clinical body fluid management system.

Medical Device - Heart Pump: Design review of electrical circuitry and design margins for a miniaturized motor that drives a heart pump.

Medical Device - Infusion Pumps: Applied PCA and clustering algorithms to device data obtained over several years to identify potential clinical scenarios that led to patient complaints regarding the product.

Medical Device - Wearable: Root cause analysis of embedded power control algorithm and circuitry for transdermal medicine delivery device.

Telecommunications - Wireless Infrastructure: Analysis of refurbishment works and repairs to nationwide telecom network after a natural disaster, including radio transmitters, fiber backbone and other sites.

Transportation - Airport Telecommunications Infrastructure: Analysis of information technology and telecommunications systems design and installation to assess compliance with project's technical requirements.

Utilities - Transmission Lines: Evaluation and modeling of electromagnetic emissions from high-voltage transmission lines (overhead and underground) against requisite standards for compliance.