BARRON ASSOCIATES

CAPABILITIES BROCHURE

MEASURE

MODEL

PREDICT

CONTROL

WELCOME

Dear Prospective Team Member,

For all of us at Barron Associates, our mission is to deliver world-class products and services through hard work, innovation, and continuous learning. We have an extraordinary team that does extraordinary things, both on the job and in the community. The growth and success of our company is a natural extension of the personal and professional growth of our employees.

For the past four decades Barron Associates has researched and developed novel solutions to challenging problems in aerospace, healthcare, and defense. These solutions frequently employ intelligent and adaptive technologies to analyze, measure, model, simulate, predict, and control complex systems, resulting in improved performance, safety, and efficiency. Our research in medical devices has yielded new technologies and approaches that promise to improve patient health care, safety, and quality of life.

Ultimately, our work results in highly innovative products, improved system performance and safety, and successful mission accomplishment in domains extending from under the sea, to on the ground, in the air, and in outer space. Please take a few minutes to learn about our company and its capabilities, and see why government and corporate customers trust our expertise and solutions.

I wish you every success in your career, and hope you will consider Barron Associates as your place to stand out in personal growth and professional achievement.

Sincerely,

B. Eugene Parker, Jr., Ph.D.
President and Senior Technical Director

BARRON ASSOCIATES

Our Approach

Measure – Model – Predict – Control

Founder Roger Barron is recognized for pioneering and advancing polynomial neural networks and their applications in 1960 with the first neurocomputing company. Today, modeling and simulating complex systems or classifying complex data is a core competency at Barron Associates. It is often a first step in comprehending and solving an engineering problem. GNOSIS is an example of a number of tools we have created that allow us to methodically and efficiently model, resolve, simulate and predict within the most complex systems and engineering environments.

GNOSIS

GNOSIS is the workhorse behind many scientific investigations. It provides powerful automated algorithms for modeling, prediction, estimation, control, and classification applications (native or C-code-compiled) based on polynomial neural networks. *GNOSIS* bas been sold to major aircraft manufacturers and government research laboratories.
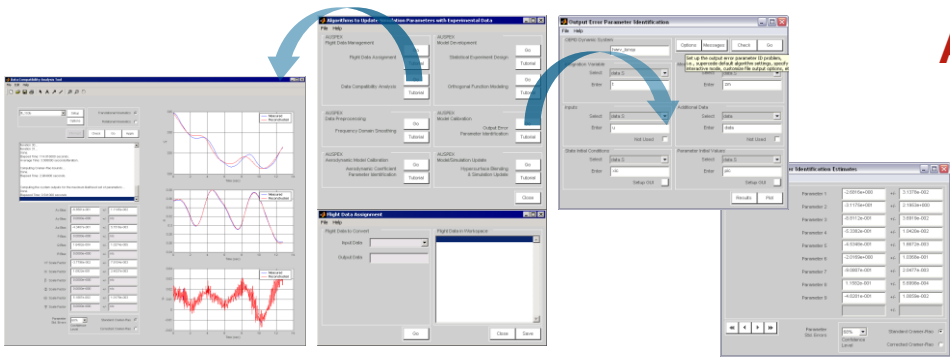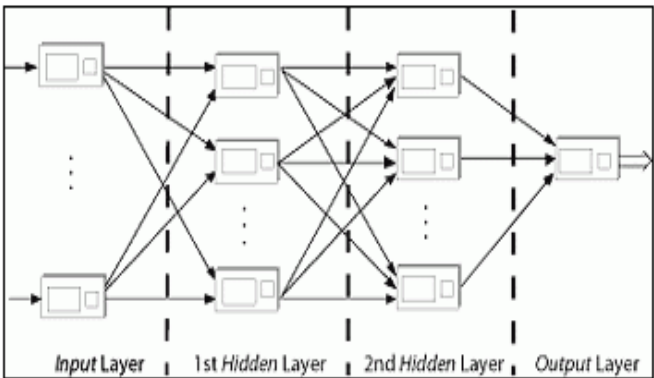
AUSPEX

AUSPEX is a MATLAB Toolkit designed for modeling data, identifying dynamical system models, and updating simulations to improve fidelity. It integrates the steps of the simulation-update and modeling process into a single environment and provides a framework to track updates and associated metadata. AUSPEX employs powerful algorithms from the fields of estimation, statistics and probability, information theory, and signal processing to generate models that not only boast improved fidelity but are based on mathematically sound and statistically rigorous techniques. AUSPEX has been successfully applied to systems such as the F/A-18 fighter, jet engine inlet modeling, UAS, morphing-wing aircraft, and multi-body systems such as the V-22 tiltrotor.

Domain Expertise

SPACE AND LAUNCH SYSTEMS

Sensor Fusion
Satellite Protection and Communications
Launch Guidance and Trajectory Planning
Human-Machine Interfaces

AIRCRAFT SYSTEMS

Adaptive Guidance and Control
Verification & Validation
Receding-horizon Optimal Control
Flight Safety

UNMANNED AIRCRAFT SYSTEMS

Autonomous Vehicles
Research, Design, and Certification
NexGen Technology
Swarm Defense Strategies

BIOMEDICAL SYSTEMS

Body-worn and Portable Sensing Technology
Fall Monitoring and Eldercare
Sleep Quantification and Disorders
Virtual Worlds and Games for Therapy

NAVAL SYSTEMS

Power Monitoring and Control
Steering Control Systems
Diagnostics and Prognostics
Underwater Vehicles

Space and Launch Systems

Photo credit NASA.

Barron Associates is proud to support NASA and the USAF in their space missions with innovative system solutions, such as astronaut gloves that provide tactile feedback to the fingertips to allow the use of computer data input and retrieval during extra-vehicular activity. This research has led to research and development of a medical application to help stroke patients regain the use of their hands and motor control through computer-guided 3D virtual reality rehabilitation therapy.

HUMAN-MACHINE INTERFACES

R&D to improve the human-machine interface, such as astronaut gloves that provide tactile feedback for computer data entry and retrieval during extra-vehicular activity.

SENSOR DATA FUSION

Design of embedded systems to increase the situational awareness of potential risks to satellites and their mission success, with the use of new sensors, data fusion, real time analysis, alerting and communications systems.

INTERNATIONAL SPACE STATION

Providing sensor electronics, software and mission analysis services.

ADAPTIVE GUIDANCE & TRAJECTORY PLANNING SYSTEMS

Providing unmanned reusable launch vehicles with advanced, intelligent adaptive guidance and path planning algorithms for all phases of their flight, from launch and ascent to reentry/terminal/touchdown.
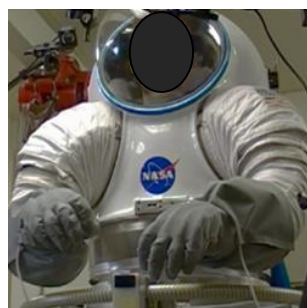
Unmanned Aircraft Systems

Photo credit NASA.

Baron Associates supports NASA, USAF, Navy and Army with state-of-the-art research and development of Unmanned Aircraft System safety, control, sense and avoid, upset recovery, certification, and other important issues as UAS are integrated in the National Airspace System. Barron Associates employees include privately licensed pilots and UAS hobbyists that are Part 107 certified. Barron Associates tests UAS aircraft at the MAAP FAA test center at Virginia Tech.

RESEARCH

R&D of UAS solutions for unique applications such as tube-launched and hybrid vehicles that can operate in atmospheric and underwater mediums.

ADAPTIVE CONTROLLERS

Control sensors and software for advanced safety, upset recovery, sense-and-avoid, and strategic capabilities

AUTONOMOUS VEHICLES

Advanced R&D providing adaptive guidance systems and mission planning for autonomous UAS that are not remotely piloted.

PRECISION DELIVERY

R&D for glide kits that provide stand-off delivery and guided delivery of dropsondes for atmospheric data, and sonobuoys for submarine surveillance.

CERTIFICATION

A design framework for rapid and safe testing and operational certification of new or changed control systems.

SWARMS

R&D of platforms instrumented with µSENS meteorological sensors and swarm and path planning software to coordinate behaviors among multiple vehicles.

Aircraft Systems

Barron Associates has delivered NASA, USAF, AFRL, Navy, and ONR, cutting edge research and development, improving the performance envelope of jet aircraft, flight safety, flight simulators, communications systems, and adaptive control systems. A sample of our capabilities is presented here.

VERIFICATION & VALIDATION

CAESAR software to intelligently guide simulation-based worst-case analysis of control system designs that improve testing efficiency and confidence in control law robustness.

RUN TIME ASSURANCE

Run-time architectures to monitor performance of high-risk algorithms and provide trusted recovery modes in the event of failure in an adaptive or learning component.

ADVANCED COMMUNICATIONS

Research and development of enhanced aircraft communications capabilities, including expanded video, data, and antenna arrays with a wide field-of-view to support air and ground coordination.

INTELLIGENT & ADAPTIVE CONTROL

Advanced controller concepts for safety, upset recovery, sense-and-avoid, outer-loop adaptive guidance, inner-loop control effector fault compensation, and probabilistic extensions of potential fault conditions.

PILOTED FLIGHT SIMULATION LABORATORY

An R&D laboratory environment that allows simulation of flight while introducing fault conditions to measure test pilot responses and effectiveness of new crew technologies.

FLIGHT TEST SAFETY

ROME software to leverage flight test data that provides real-time monitoring and prediction of safety margins, decreasing the probability that a test is allowed to proceed to an unsafe condition.

Photo credit USAF.

Biomedical Systems

Barron Associates has a long tradition of research and development of technologies that advance the capabilities of healthcare and quality of life for individuals. Barron Associates works closely with the National Institutes of Health in its funded extramural research programs, pioneering in research into assistive technologies that improve balance, reduce falls, measure energy expenditure, and non-obtrusively measure and transmit physiological signals such as vital signs. Examples of our capabilities include:

WEARABLE DEVICES

R&D of non-invasive non-obtrusive body-worn sensors, embedded processing, and wireless communications for real-time ambulatory monitoring and alerting of physiological signals and kinematics for fall detection, energy expenditure, balance, and pain assessment.

VIRTUAL THERAPY ASSISTANT

Sensor-enabled video games and virtual environments that guide patients through proper therapy techniques, measure results and increase adherence in fields such such as stroke rehabilitation, knee rehabilitation and vision development in children.

RISK ASSESSMENT

Bayesian-based methods for identifying and stratifying hospital patients at risk for falls, for the efficient use of intervention resources.

PATIENT COMMUNICATIONS

R&D of blink- or facial-gesture-based image processing systems that allow patients with limited motion capability to communicate with caregivers.

SMALL ANIMAL MONITORS

Wearable monitors for noninvasive monitoring of physiologic signals in small animals that allow freedom of movement and socialization to improve research outcomes.

SPORTS MEDICINE

R&D of portable monitors to assist in the field-side assessment of potential concussion in athletes playing contact sports such as football and lacrosse.

ANIMAL TRAINING SYSTEMS

Automated system for training and evaluating the performance of small animals in the safe detection of landmines for humanitarian removal efforts.

Naval Systems

Photo credit U.S. Navy.

Barron Associates has a long tradition supporting the U.S. Navy and Marines, including NAVAIR, NAVSEA, ONR and NRL. Examples of our capabilities include:

STEERING CONTROL SYSTEMS

A design methodology that has demonstrated the blending of diverse control effectors that are in piloted and autonomous undersea vehicles while providing rigorous stability proofs for the inner-loop, integrating state estimation and path-planning capabilities.

DIAGNOSTICS & PROGNOSTICS

R&D of health maintenance systems for major machine plants, has yielded a diagnostic and prognostic methodology that applies to a wide range of complex dynamical systems for the health monitoring of large power plants in naval vessels, land vehicles, and stationary power plants.

SHIP ELECTRICAL POWER

R&D techniques, including modeling of electrical power fault detection, that can make a many-fold improvement in the safety and reliability of electrical systems. An example is the Barron Associates high-speed relay (HSR) algorithm currently in service in the Multi-Function Monitor (MFM) III protecting electrical power distribution on Arleigh Burke Class hulls DDG 91 and above.

UNDERWATER VEHICLES

R&D of automated controllers for the launch and retrieval of underwater vehicles from larger vessels such as Littoral Combat Ships and submarine rescue vehicles.

Contact Us

Thank you for your interest in Barron Associates. For further information, please contact us by email or use our headquarters address below.

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