Eytan Suchard

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Objective

To perform research in exotic propulsion based on unaccounted-for charge-based gravity and to reach a feasible Hermann Bondi inertial dipole, also known as gravitational dipole. To develop non-geodesic acceleration based Lagrangians in spacetime geometry and to replace spinors by Scarr-Friedman acceleration matrices. To keep it simple or at most use vierbein formalism.

Also seeking position to continue working in machine learning projects, and to develop advanced machine learning algorithms.

Work Experience

Algorithms Developer

SODA Ltd., Caesarea Israel. Responsibilities: 2021-Now

- Time series analysis with Regression Transformers, LSTMs.
- Inter-process communication via Python's Flask.
- NLP, Hugging Face, SpaCy.
- Development for Docker (one project).
- Designing Depth map neural networks.
- Designing UNets.
- Point Cloud, STL.
- Collaborative Filtering, SVD.
- Automatic ML based trading – development of neural networks.
- C++ PyBind11 extensions to Python.

Algorithms Developer   2020-2021

Amplio.AI – Chantilly, VA Responsibilities:

- Analysis of reps.
- Segmentation of a video of exercises into reps and alignment to a template, using GRUs and LSTMs. Analysis of exercise performance errors.
- Achievement of high quality alignment to a template in low to medium motion speed including in moderate to medium exercise variability.
- Achievement of a high quality prediction of running speeds of athletes based on different modalities via development of a new regression tree that outperforms BART.

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- Data handling from CSV files, InnoDB SQL dump files and JSON. Analysis of key-points output from Open Pose, time series analysis. Responsible for coding both in Python and in C++ and for writing Python extensions by writing in C++ via PyBind11, including code in CUDA. I also became familiar with Transformer networks although I have no practical experience with Transformer networks.

Algorithms Developer   2018-2020
Metivity- Sarid, Isreal Responsibilities:
- Online work for prediction of machine failures within 5 days. The work includes Neural Networks, Decision Trees, Gradient Boost Trees both in Python and in C++. It also includes Massive CSV preprocessing in C++, and the usage of sklearn and of numpy in Python for model efficiency testing.
- Achievement of 75% of accuracy in failure prediction that did not seem to be possible and was not possible with ordinary Neural Network approaches.

Algorithms Developer   2017-2018
AIRG – Even Yehuda, Israel
- Responsibilities: Coding a bicycle, pedestrian, cars, buses and trucks classifier in CUDA C++ while using low level GPU kernel procedures, Deep Learning, and preprocessing algorithms. The objective of the project was a computer program that facilitates driving a car.
- Achievement of over 99% accuracy also in low quality pictures.

Algorithms Developer   2015-2017
Applied Neural Biometrics –Even Yehuda, Israel
- First responsibility: My role was to code what/where neural networks which included low level GPU CUDA kernel procedures, and to develop a Deep Neural Network from scratch without using PyTorch, TensorFlow, Theano, or Caffe. The work included the development of a solution to the What/ Where problem for the purpose of object identification and localization, the usage of other methods than YOLO, RCNN, Fast RCNN, SSD, and the design of an application for traffic signs identification. The training program was coded in C#, which batch trained a CUDA C++ DLL in which a 96 x 96 x 3 input to a CNN was used. The CNN output was 10 for 10 traffic signs and localization rectangles. CUDA versions were 8.5.2. and 9 in later versions when the company turned into AIRG. The project did not use KAZE, SURF or SIFT, instead, the project included work with OpenCV 2.4.3 HOG Descriptors, blob analysis, snake contours, and it involved hands - on low level Convolutional Neural Networks, CNNs, in order to achieve a special proprietary convergence method that prevents neural weights degeneracy. The objective was a computer program that facilitates driving a car.
- Achievement of over 99.5% of traffic sign identification accuracy.

- Second responsibility: My role was to maintain and to upgrade a signature recognition project that was initiated in a previous company, ANT – Applied Neural Technology. Achievement of 95% identification of finger motion on a touch screen as a password and over 99% identification of a forgery.

Algorithms Developer   1998-2015
ANT Applied Neural Technology – Kfar Noether and Herzeliya, Israel
- My role was to develop a breakthrough algorithm in applicable math (see "Cumulative Orthonormalization" In http://www.freepatentsonline.com/6661908.html) for hand signature recognition. The achievements of this method is that it proved to be useful also in verification of a document based on color marks, e.g. Inksure with accuracy close to 100%.
- The work included the usage of Kernel PCA and of High Order Clustering in hand signature recognition. It also included coding a specially tailored algorithm, which used high order clustering, and Kernel PCA. The project also included development of online signature recognition application, which used a C# wrapper that called a C++ DLL. The C# wrapper was a data acquisition GUI. The user signed 5 signatures for enrollment. If there was an inconsistent signature, my role was to identify the deviated signature and to mark it such that the user could sign it again. The second function of the program was verification. The dynamic signature was embedded in the signature image and was sent to a server via SOAP calls. Upon verification, the image was used to sign a PDF document. The signature engine was based on Dynamic Programming and on statistics.
- Second responsibility: My role was to take part in standardization in January 2006 in Kyoto Japan and later that year in London in the ISO standardization of behavioral biometrics, SC37. The objective was to reach a comprehensible set of Application Programming Interface, API, functions by which customers would use hand written signature applications. The main achievement of this standardization is that my company's API offer was accepted.

- Third responsibility: My role was to perform sound recognition using recurrent neural networks combined with genetic algorithms for the Israeli military. The project comprised of a proprietary Genetic Algorithm along with small fully connected Neural Networks. The objective was to distinguish between different explosion sounds under different terrain and near echo sources. The main achievement is that at the P.O.C. we succeeded to reach 80% accuracy based on less than 500 training samples altogether including positive and negative samples.

- Fourth responsibility: My role was to visually assess the binding of a light emitting protein to peptides. The following techniques were used: Image denoising, image histogram enhancement, lens distortion correction, shape context matching via minimum action, calculus of variations, image dehazing via

calculus of variations, and bilateral filters. The achievement was that the success of the filter was close to 100%.

- Fifth responsibility: My role was to include Fuzzy Logic simulation of Minimum Action analog computing machines in order to solve non-rigid shape matching problems by means of a generic analog chip. This chip is based on a physical model of induced dipole alignments in a dynamic electric field. The alignment uses local electric fields, local magnetic fields - due to induced dynamic currents - and head to head dipole interactions. Each dipole interacts with near neighbors only. This is the most advanced Machine Learning, ML, project I was responsible for. The achievement of this project is for example in solving Dynamic Time Warp by an analog machine.

C++ and Visual Basic GUI, Database GUI and Real Time Developer   1992 – 1998
Medoc LTD – Ramat Yishai, Israel, https://www.medoc-web.com/
- Responsibilities: My roles were versatile and consisted of programming Real Time PID cascade control, programming of RS232 RT communication, management of a BTRIEVE database, development of C Fibers medical testing algorithms via Thermal Sensory Analysis, designing GUI for database interface, and coding GUI for patient testing. The programs were coded for Windows 3.11, 95, 97 in C++. The main achievement is selling machines to hospitals all over the world.

Education
Technion Haifa – Israel Institute of Technology   September 1988 - February 1992
Undergraduate in Mathematics Faculty. Emphasis on courses related to algorithms, differential geometry, and differential topology. Studied General Relativity under Professor Nathan Rosen:
http://en.wikipedia.org/wiki/Nathan_Rosen

Credentials
MIT EdX "Machine Learning with Python-From Linear Models to Deep Learning",
June-11-2019 until September-9-2019. The course included Matrix Factorization, LSTM, Deep Learning, SMV/kernel classification methods, Maximum Likelihood Optimization, and Reinforcement Learning.

Granted Patents – BIOSIGN (14)

Country	Official No.	Title
USA	6661908B1	Signature recognition system and method. Especially look for, **Cumulative Ortho-Normalization**
Germany	60246905.8	System for and method of Web Signature Recognition System based on Object Map
France	1461673	Validating the identity of a user, using a pointing device

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Country	Official No.	Title
Ireland	1461673	Validating the identity of a user, using a pointing device
USA	6687390	System for and method of web signature recognition system based on object map
USA	7715600	System for and Method of Web Signature Recognition System Based on Object Map
USA	9185096	Identity Verification
USA	9053309	Behaviometric signature authentication system and method
UK	1461673	Validating the identity of a user, using a pointing device
Europe	1461673	Validating the identity of a user, using a pointing device
UK	2511812	Behaviometric signature authentication system and method
UK	1508843.8 (2523924)	Behaviometric signature authentication system and method
UK	1600390.7 (2530695)	Behaviometric signature authentication system and method
UK	1612942.1 2540280	Behaviometric signature authentication system and method
USA	6735336	Apparatus for and method of pattern recognition and analysis

Granted Patents – BIOCHOP (5)

Country	Official No.	Title
USA	13/831102 9741085	A method, apparatus and system of encoding content and an image
UK	2511813	A method, apparatus and system of encoding content and an image
UK	2524181	A method, apparatus and system of encoding content and an image
UK	2511814	A method, apparatus and system of encoding content and an
Country	**Official No.**	**Title**
		image
USA	13/831158	A method, apparatus and system of encoding content and an image

Granted Patents – Transformatron (1)

Country	Official No.	Title
USA	7424462	Apparatus for and Method of Pattern Recognition and Image Analysis

Publications

Patent which also includes research of non rigid analog shape matching
http://www.docstoc.com/docs/56941569/Apparatus-For-And-Method-Of-Pattern-Recognition-And-Image-Analysis---Patent-7424462

Sudoku and Graph Theory (classification of best matches in bipartite graphs),
http://drdobbs.com/cpp/184406436

SQUARE FRACTAL ALGORITHM (Curves that compete with Hibert Curve for catching closeness in more than one direction in images)
http://www.worldscinet.com/fractals/13/1301/S0218348X05002763.html

Genetic Algorithms Research
https://evoinfo.org/auxilary-publications/genetic-algorithms-and-irreduciblity.html

Theoretical physics research and advanced propulsion systems IARD 2016 conference – Presentation of elecro-gravity. Please note that this is not the most correct paper but a peer reviewed one. 4 / June / 2017, publication of "Electro-gravity via Geometric Chronon field" http://iopscience.iop.org/article/10.1088/1742-6596/845/1/012019 The conference link: http://www.iard-relativity.org/iard2016/ or search in Google for IARD 2016. A much more advanced paper with multiple corrections can be found in ResearchGate.net, see also "Patent application 16/177167 is shared with my wife Jessica as a co-inventor. We also have another partner, Eng. Raviv Yatom. The most correct paper can be found in:
https://www.researchgate.net/publication/335107380_Electro-gravity_via_Geometric_Chronon_Field_and_on_the_Origin_of_Mass

The challenge is understanding the theory. It requires understanding of 4 subjects,
1) The Geometric Theory of Foliations.

2) Reeb Class vectors and especially the original formalism which can be used also in even dimensions. It is not the usual Reeb vector from contact manifolds.

3) Tzvi Scarr-Yaakov Friedman acceleration matrix.

4) Symplectic Geometry directly on the manifold without any phase space.

5)   IMHO, even without mastery of these 4 subjects, the paper can be read, however, deep understanding does require some knowledge in all 4 subjects. Another obstacle is a quantum leap from geodesic geometry to non-geodesic geometry. The latter is a conceptual problem.