

Dr. Linas Vepstas

Curriculum Vitae



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DOCTORAL RESEARCH

“The Cheshire Cat Chiral Bag”

The **Chiral Bag Model** is a model of the nucleon consisting of a harmonic map of the chiral anomaly (the pion cloud as a Skyrmion or topological soliton) on the exterior, and a free quark spectrum plus vacuum contributions on the interior, coupled by the conservation of the axial current at the boundary. It predicts the low-energy properties of the baryon (mass, axial coupling) to within 10%.

WORK EXPERIENCE

Hanson Robotics

Robotics research & development. Good regulator theorem for action & perception via coupling of natural language to a vector-symbolic graph database (**OpenCog AtomSpace**) for inference and control.

2014 – 2019

Poulin Holdings

Machine learning of unstructured medical text, for VA Hospitals suicide prediction for US veterans.

2011 – 2014

Qualcomm

Linux kernel development. Binutils, GCC, Glibc, linker-loader, TLS & EH for the Qualcomm Hexagon CPU.

2010 – 2011 (CONTRACTOR)

Novamente/Cerego

Natural language processing, semantic frames for Japanese language education.

2007 – 2009 (CONTRACTOR)

IBM

Linux kernel development. **PCIe Error Recovery (EEH)**, **PCIe SRIOV**. Hypervisor firmware.

2003 – 2007 (CONTRACTOR)

Gnumatic

Founder & CEO

Commercialize the **GnuCash** personal finance and small business accounting system. Raised \$1M USD seed funding.

1998 – 2001

Teleport Travel/Intransco

Founder & CEO; CTO

Web-based air travel and hotel reservation system. Early dot-com startup. Raised \$1M USD series A funding.

1995 – 1997

IBM

Advisory Programmer

Graphics Architect. Specify the OpenGL API. Interface with hardware (graphics chip design), CPU architects, I/O subsystem architects, OS kernel, compiler, marketing, product planning.

1988 – 1998

EDUCATION

1991 **Visiting Scientist**

Theoretical Physics
Uniwersytet Jagiellonian, Krakow, Poland

1990 – 1991 **Post-Doctoral Fellow**

Theoretical Physics
SPhT, CEA/CEN Saclay, France

1986 – 1990 **Doctor of Philosophy**

Theoretical Physics
SUNY at Stony Brook

1980 – 1984 **Ars Bacalaureat**

DEANS LIST
Department of Physics
The University of Chicago

AWARDS

2000 **Honoraria**

Recognition for Linux i370 on the Mainframe
Hitachi

COMPUTER SKILLS

INTERMEDIATE	SQL, Python, Java, radio modems
EXPERT	PCIe, PowerPC architecture, I/O bus, Scheme, C++, OpenGL, Linux kernel internals, graph databases

COMMUNICATION SKILLS

CONFERENCES	AGI Conference – 2020, 2021
PRESENTER	Austin Science Club – 2018-2022 SIGGRAPH – 1995
STANDARDS BODIES	OpenGL Architecture Review Board – 1990-1995
GOVERNING BODIES	GnuCash Foundation 1995-present

REFERENCES

Dr. Ben Goertzel

FOUNDER Singularity.AI
EMAIL bengoertzel@gmail.com
PHONE Available on request

Dr. David Hanson

FOUNDER Hanson Robotics
EMAIL david@hansonrobotics.com
PHONE Available on request

SKILLS

Management by Walking Around

I am able to direct engineering groups to work towards a common goal, resolving issues and confusion over intent and direction. To get people enthused and working together. I have coordinated with marketing departments and product planning, helping set vision and messaging.

Founder

As founder and CEO of several startups, I've learned to work with customers, marketing, sales, suppliers, lawyers & VC's, finance and peer executives. I also learned to hate cold calls.

Technical Mastery

During my early career in hi-tech, I attempted a grand tour of every field in computer engineering, from CPU architecture internals, to compilers, OS kernels and database design & architecture.

I learned by doing, and made significant contributions to each of these. Specifically, FP select and other insns for PowerPC; the i370 port of **Linux to the Mainframe**; the **OpenCog AtomSpace** vector-symbolic graph database. Hands-on user application development too: lead developer for the **GnuCash** accounting system.

Research

Focus for the last decade has been on a highly abstract mathematical approach to AGI (Artificial General Intelligence). It is a find of "flip-side of the coin" to LLM learning, attempting to directly obtain structural relationships between semantic content in different domains, by extracting similarities into semantic, symbolic categories at the same time that structural (grammatical, syntactic) relationships are constructed. Rather than learning networks through gradient descent and obtaining relationships/memory through attention heads, the approach attempts to obtain symbolic information by counting. That is, rather than having attention be a vector/string of recurring n-grams, it is replaced by explicit syntactic structures, having direct and immediate grammatical structure. One of the primary difficulties of this approach is extending concepts of information theory (Bayesianism) to a syntactic, grammatical framework.

The research has been carried out in a dual theoretical and experimental framework. The experimentation is done using the **OpenCog AtomSpace**. Structure representation uses **Link Grammar**, with extensions for audio and vision. The umbrella experimental platform is the **OpenCog Learn** project.

Bona Fides

I have made large contributions to more than 500 articles in Mathematics on Wikipedia, and have a broad survey understanding of most branches of mathematics, including number theory, dynamical systems, ergodicity, set theory, logic, grammar, general topology, algebraic topology, algebraic geometry, Riemannian geometry, gravitation, quantum field theory, string theory.

I have kept an eye on advances in microbiology, neuroscience, health and longevity, astronomy.

SELECTED PUBLICATIONS

ORCID: 0000-0002-2557-740X

Linas Vepstas, A.D. Jackson (1990). Justifying the Chiral Bag. *Physics Reports*, **187**(3), pp 109-143.
doi: 10.1016/0370-1573(90)90056-8

Linas Vepstas, John Cook (1991). Multiple Command Set Support for Rendering Components **Multiple Command Set Support for Rendering Components**. *US Patent No. US-5504928-A*. *European patent application #92306537.9* - (applied in DE, FR, GB).

Philippe Flajolet, **Linas Vepstas** (2008). On Differences of Zeta Values. *Journal of Computational and Applied Mathematics*, **220**(1-2), pp 58-73.
doi: 10.1016/j.cam.2007.07.040

Linas Vepstas, (2010) Structure in Linguistics. *International Journal of Corpus Linguistics*, **15**(2) pp 357-362.
doi: 10.1075/ijcl.15.2.06vep

Christian D. Poulin. Paul Thompson, **Linas Vepstas** (2014). **Text Based Prediction of Psychological Cohorts**. *US Patent US-20140222719-A1*.

C. Poulin, B. Shiner, P. Thompson, **L. Vepstas**, Y. Young-Xu, *et al.* (2014) Predicting the Risk of Suicide by Analyzing the Text of Clinical Notes. *PLoS ONE* **9**(1): e85733.
doi: 10.1371/journal.pone.0085733

Linas Vepstas, (2018) Sheaves: A topological Approach to Big Data. *OpenCog Foundation Technical Report*.

Linas Vepstas, (2018) Gradient Descent vs. Graphical Models. *Hanson Robotics Technical Report*.

Linas Vepstas, (2018) On the Beta Transformation. *arXiv: 1812.10593v3*.
doi: 10.48550/arXiv.1812.10593

Linas Vepstas, (2020) Graphs, Metagraphs, RAM, CPU. *OpenCog Foundation Technical Report*.

Linas Vepstas, (2023) Purely Symbolic Induction of Structure. *International Conference on Artificial General Intelligence AGI 2022: Artificial General Intelligence* pp 134-144.
doi: 10.1007/978-3-031-19907-3_13

Linas Vepstas, (2023) Grammar Induction - Experimental Results. *International Conference on Artificial General Intelligence AGI 2022: Artificial General Intelligence* pp 413-423.
doi: 10.1007/978-3-031-19907-3_40