





VIOLET I JOHNSON

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PhD candidate with 5+ years research-focused software engineering experience & 4 years related teaching experience. Seeking full-time roles (July '24) in Game Dev, DSP, VR, Robotics, HCI, & ML.

EDUCATION

University of North Texas, <i>PhD in Computer Science & Engineering</i> TX, USA		July 2024
University of North Texas, <i>MS in Computer Science & Engineering</i> TX, USA	3.8 / 4.0	May 2017
University of North Texas, <i>BS in Computer Science, Minor in Mathematics</i> TX, USA	3.2 / 4.0	May 2013

Finalist: Aspirations in Computing Award 2024, NCWIT

DISSERTATION

“Convolutional Neural Networks in the Domain of Non-Lexical Audio Signals” Published Jul 2024

My research explored the intersection of convolutional neural networks and raw non-lexical audio signals by detailing the development and results of projects in mutation detection, upscaling, classification, and generation. I sought to study at a granular level the application of CNNs to any discrete temporal signals with dense periodic features, with a primary focus on music and components of audio composition for music and video game production. All projects demonstrated quantifiably successful approaches to their respective problems, & in the case of generation, provided an extensive ground-up analysis of the impact of many architecture design variation on early training inference quality. This included 2 novel architecture categories (PrismGAN & SBIGAN) I proposed and demonstrated to solve an artifacting phenomenon I observed to be uniquely problematic for strided deconvolutional architectures operating on digital signals.

PUBLICATIONS

Articles/Papers

- V. Johnson, I. Parberry** (2020). Music Upscaling Using Convolutional Neural Networks. *2020 3rd International Conference on Sensors, Signal and Image Processing (SSIP 2020)*, 58-62
- R. West, V. Johnson, I.C. Yeh, Z. Thomas, E. Mendelowitz, L. Berg** (2018). Instrument | one antarctic night. *ACM SIGGRAPH 2018 Art Gallery (SIGGRAPH '18)*, 439-440
- R. West, V. Johnson, I.C. Yeh, Z. Thomas, M. Tarlton, E. Mendelowitz** (2018). Experiencing a slice of the sky: Immersive rendering and sonification of Antarctic astronomy data. *Electronic Imaging: The Engineering Reality of Virtual Reality 2018*
- J.P. Lewis, I.C. Yeh, A. Migalska, V. Johnson, R. West** (2017). Exploring the definition of art through deep net visualization. *31st Conference on Neural Information Processing Systems*
- M. Parola, V. Johnson, R. West** (2016). Turning presence inside-out: MetaNarratives. *Electronic Imaging 4*: 1-9

Posters

- V. Johnson, R. Renka** (2016). Triangle mesh generation combining edge splitting and angle-based smoothing. *Posters, 25th International Meshing Roundtable, Sandia National Laboratories*

Presentations

- R. West, V. Johnson, I.C. Yeh, T. Margolis, J. Gossmann, A.S. Horn, J.P. Lewis, R. Singh, J. Schulze, I. Mostafavi, B. Hackbarth, W. Li, T. Henthorn, J.I. Girardo, A. Prudhomme** (2017). ATLAS in silico. *MOFO Festival at the Museum of Old and New Art in Hobart, Tasmania*
- R. West, T. Margolis, J. Gossmann, A.S. Horn, J.P. Lewis, R. Singh, J. Schulze, V. Johnson, I.C. Yeh, I. Mostafavi, B. Hackbarth, W. Li, T. Henthorn, J.I. Girardo, A. Prudhomme** (2016). ATLAS in silico. *The National Academies Keck Futures Initiative Conference*

EXPERIENCE

University of North Texas Dept of Comp Sci & Eng, Teaching Faculty, Instructor | TX, USA Jan 2022 - May 2022

- Course: Game Programming II (Undergrad & Grad) - Game programming techniques for implementation of functional projects from scratch in a combination of Unreal & a pure C++/DirectX engine.
- Curriculum design, development of teaching tools, lecturing, grading, & directing labs.

University of North Texas Dept of Comp Sci & Eng, Teaching Assistant | TX, USA (Hybrid) Aug 2020 - Present

- Game Programming I & II (Undergrad & Grad) - C++/DirectX & Unreal game dev programming.
- Game Math & Physics - OOP linear algebra physics system programming for games.
- Computer Science I & II (Undergrad) - Software design, structured programming, OOP, C/C++ basics.
- Database Admin I & II - Postgresql management.
- (More courses unlisted), Curriculum design and deployment, individual tutoring, grading, & directing labs.

- Development of hybrid art-science interactive exhibitions, with focus on 3D data-driven multiplayer VR experiences. In this position I contributed to many varied projects. The ones I lead involved taking large-scale scientific datasets and parsing them into collaborative exploration tools.
- Utilized multiple systems and languages primarily including: Unity, C#/C++, Python, MySQL, PD, Max/MSP, CUDA, HLSL, & OpenCV.

- Maintained the college's primary website, full stack.

SKILLS

Languages	Python, C/C++, C#, HLSL, Java, CUDA, Matlab, Git, Bash, LaTeX, PHP, Postgres/MySQL, DirectX, Objective C, Arduino
Software	Linux, Tensorflow, Theano, Keras, Pytorch, OpenCV, Unity, Unreal, PD, Max/MSP, Many DAWs
Certifications	Game Programming Certification, University of North Texas – (2014)

PROJECTS

ML Projects – Doctoral research

Jan 2018 - Jan 2024

- **Generative raw audio adversarial networks** - implemented around 150 GAN architectures including the structurally novel PrismGAN & SBIGAN, for controlled experimental comparison.
- **Music upscaling** - dilated CNN for raw audio music super-resolution. Outperforms baseline in average 2x case, with increased advantage with repeated upscaling
- **Instrument sample classification** - compact CNN for supervised raw audio sample separation, 95%+ accuracy on any class combination
- **Data mutation detection** - dilated CNN for detecting the presence of sparse hidden messages injected into online game network traffic by a system resistant to statistical analysis methods. Needs no prior knowledge of network protocol and needs only a partial play session for reasonable confidence.

ML Projects – Graduate

Jan 2016 - Jan 2018

- **Transform-robust art classification and activation visualization** - deep CNN for binary classification of images as human-made art, trained on large dataset of human-made artworks along with semi-curated scraped non-art images. The trained network was used to iteratively optimize an image toward maximizing activations, with the idea of visualizing the network's concept of what makes an image qualify as art. Training and image synthesis both used intermediate random transform layers of various types, to vastly increase the network's perceptual range with no needed additional data.

Research Projects– Graduate

Jan 2014 - Jan 2020

- **Instrument: One Antarctic Night** - Multiplayer VR art-science data exploration system, exhibited at several museums & conferences. Utilizing night sky data collected from antarctic telescope combined with web-scraped metadata extensions from multiple sources, provides a VR interface where users are placed inside the cloud of astronomical bodies and can explore millions of data points through manual manipulation of any individual point. Doing so allows users to drill down to all available metadata about each point, while procedurally generating a unique audio-visual component which can be activated as part of a collaborative composition with other players.
- **Binaural Positional Audio Simulation** - Utilizing sine-sweep inverse convolution of recordings placed around a binaural microphone array, provides a system for artificially positioning audio in a perceptual 3D space as a real-time software effect (similar to HRTFs).

Game Projects– Undergrad/Graduate - All C++ & DirectX

Jan 2010 - Jan 2017

- **Audio-only experimental game** - Utilizing xAudio and positional audio tools, a 3D world simulation with no graphical interface at all meant to be explored purely through sound with interactable goals throughout. Part of a study I developed to test if humans are capable of navigating game worlds through audio.
- **WavRide** - A 3D rhythm game wherein a music track is split into stems which can be activated by a player one by one, with the goal of keeping the full composition going. The stems are on individual lanes the player can move between, and activated by moving a flying ship along notes procedurally placed on these lanes using a peak detection algorithm.
- **Stick Fighter** - A 2D fighting game with stick figure characters. The system uses 2D animated sprites for the characters rendered against a 3D background. The game features standard fighting systems like special moves and combos, with features such as a gravity and scaling based juggle system.
- **Bot** - A simple 3D platformer designed around technical movement, with features such as wall-runs and wall-jumps.