Tobias **Brandner**

MSc Computer Science · Specialization in Artificial Intelligence

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"There is a difference between forgetting something and never having learned it." - Dr. Frederic P. Schuller

Education

MSc in Computer Science - Specialization in Artificial Intelligence
Grade 1.5

Julius-Maximilian-University Würzburg
Apr. 2021 - Sep. 2024

- Focused on data processing and machine learning, specialized in the field of computer vision.
- Thesis topic: Real-Time Rendering Super Resolution with Unreal Engine 5
- Notable Courses: Computational geometry, Machine learning for NLP, Programming with neural nets

BSc in Games Engineering
Grade 1.8

Julius-Maximilian-University Würzburg
Oct. 2017 - Sep. 2021

- Focused on of math, algorithms/datastructures and programming for real-time interactive systems.
- Thesis topic: Crowdsourced Help Facility Design and Management for Authoring Platforms
- Notable Courses: Algorithms and datastructures, Software technology, Logic for informatics

Physics studies
No degree

Friedrich Alexander University Erlangen
Oct. 2013 - Mar. 2017

Allgemeine Hoschulreife - Abitur
Grade 2.7

Werner-von-Siemens-Gymnasium Weissenburg i. Bay.
Sep. 2005 - Jul. 2013

Experience

Research Assistant - C# Developer
Würzburg, Bayern

Julius-Maximilian-University
Nov. 2021 - Aug. 2023

- Worked part-time on a de-serializer for 3D scene data (json) to import scenes from the Mozilla Spoke editor into the Unity editor.
- Ensured that the behavior of the scene objects is mimicked correctly, e.g. lights influence the scene as desired.
- Encapsulated this functionality in modules (implemented in C#) to remove the dependency once the scene is converted.

Teaching Assistant - C++ Developer
Würzburg, Bayern

Julius-Maximilian-University
Aug. 2020 - Aug. 2023

- Taught a course part-time about building game engines in C++ with CMake, including rendering (OpenGL), input, asset management and physics.
- Extended the existing C++ code base (Gitlab) with additional lessons, adding and maintaining documentation (Markdown).
- Supported students on their own code projects.

Internship - C# Developer
Würzburg, Bayern

Gentle Troll Entertainment GmbH
Apr. 2020 - Jun. 2020

- Worked together with an agile team on a serious game teaching children about sport management developed with Unity.
- Programmed game play logic in C#.

Projects

Fusion Engine - Generative Neural Rendering

Computer Vision, Pytorch, Python, C++, CMake
Jan. 2025 - Present

- Researching generative neural rendering as a potential alternative to traditional graphics pipelines.
- Developing a real-time rendering prototype that allows switching between neural and traditional rendering using a simplified ASCII-based representation.
- Implementing the PyTorch C++ API for efficient inference, exploring optimization techniques for real-time performance.

Neural Rendering - Unreal Real-Time Rendering Super Resolution

COMPUTER VISION, PYTORCH, PYTHON, UNREAL ENGINE 5   *Jan. 2024 - Sep. 2024*

- Developed a neural network to increase the resolution (1080p to 4k) as well as mitigating artefacts (e.g. aliasing) of rendered frames in real-time.
- Generated and labeled a new dataset (around 500GB) using Unreal Engine 5, containing different animated 3d-person characters traversing four different high fidelity environments.
- Designed and iterated on the neural network architecture (CNN, U-Net and ViT) in Pytorch (Python).
- Compared results to other implemented SOTA methods on image quality metrics (PSNR, SSIM and LPIPS), VRAM usage and inference speed.

Abyssal Engima - Dive In Edition (VR)

VIRTUAL REALITY, UNREAL ENGINE 5   *May 2023 - Nov. 2023*

- Collaborated on a first person deep sea exploration game made in Unreal Engine 5 in a team of 6 people, including writer, designer and artists.
- Implemented the first person controller, including animations, particle/audio effects and in-game cinematic.
- Ported the game to Virtual Reality (VR), incorporating anti-motion sickness techniques, e.g. virtual nose.

Multi Language Image Classification

COMPUTER VISION, PYTORCH, PYTHON   *Apr. 2023 - Sep. 2023*

- Modified existing vision-language classification models to explore them in a multi-lingual context.
- Extended a Python/Pytorch code base with other open-source pre-trained vision-language models (Roberta-ViT-B32) and few-shot trained them on Caltech101 dataset.
- Analyzed the results to increase the models accuracy on more difficult multi-lingual tasks.

Exploring Game Flow - Boss'n'Run

UNREAL ENGINE 5, C++, PYTHON, MATPLOTLIB, PANDAS   *Sep. 2022 - Jun. 2023*

- Build a 3D Jump'n'Run prototype with two colleagues in Unreal Engine 5, where the level layout is procedurally generated based on the movement parameters of the player character.
- Designed, animated and rigged the player character (Blender) and implemented multiple different movement mechanics, e.g. climbing.
- Collected movement data from different 3D jump'n'runs, e.g. Super Mario 64, and analyzed the data in 3D plots (Matplotlib & Python).
- Presented this work at the Conference of Games (CoG) in Milan - 2024.

Eternal Game Engine

C++, CMAKE, OPENGL   *Mar. 2020 - Mar. 2021*

- Build a game engine in C++ with its own editor to make a simple 2D jump'n'run about leading a duck egg back into its nest.
- Focused on implementing an extensive editor (Dear ImGui) to edit and save my levels as .yaml files.

Publications

Analysis and Generation of Flow in 3D Jump'n'Run Games

TOBIAS BRANDNER, MARC MUSSMANN AND SEBASTIAN VON MAMMEN   *IEEE CoG - 2024*

Investigating Crowdsourced Help Facilities for Enhancing User Guidance

SOORAJ BABU, TOBIAS BRANDNER, SAMUEL TRUMAN AND SEBASTIAN VON MAMMEN   *IMET - 2023*

Skills

Programming	Python, C++, C#, Java, Rust
Frameworks	Pytorch, OpenCV, Matplotlib, Pandas, OpenGL
Game Engines	Unreal, Unity, Godot
Tools	Git, CMake, Blender
Languages	German (fluent), English (proficient)
Competencies	Curious, Consistent, Creative, Friendly, Patient

Honorable Mentions

2024	**Speaker**, IEEE Conference of Games	*Milan*
2024	**Collaborator of the winning team**, Healtcare Hackathon	*Würzburg*
2024	**Listener**, GodotCon	*Berlin*