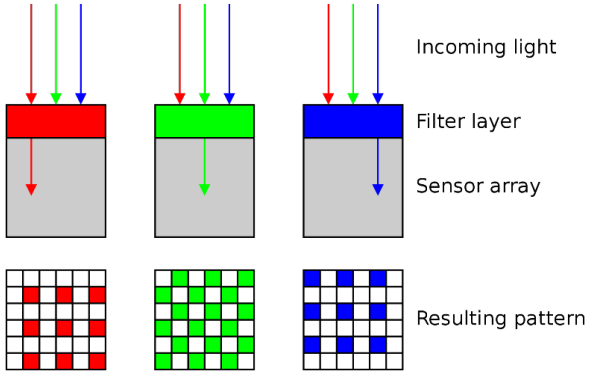
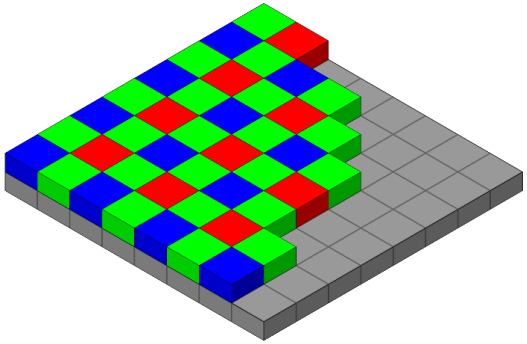
Perfil CG

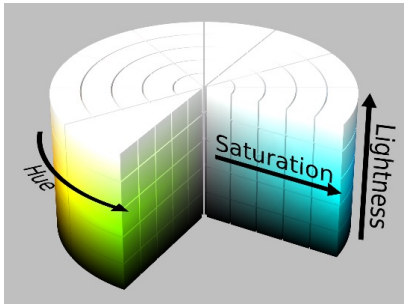
3D Graphics and Computer Vision

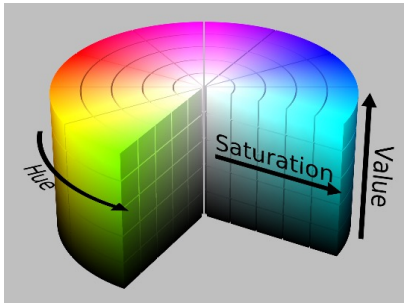
- António Ramires Fernandes (arf@di.uminho.pt)
- Luís Paulo Santos (psantos@di.uminho.pt)

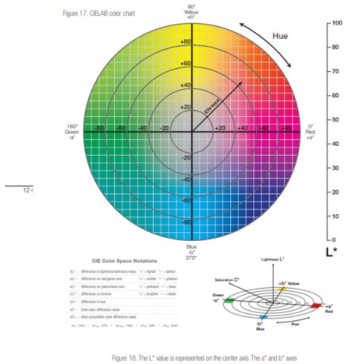
Image Acquisition and color Spaces

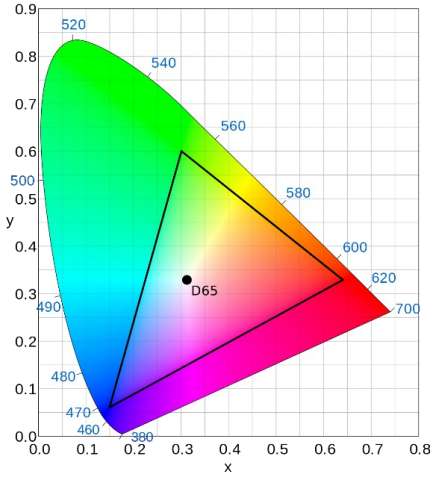






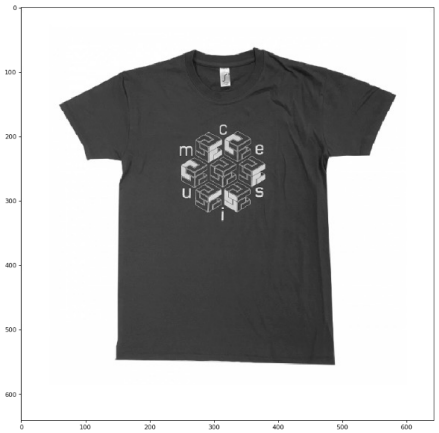






Fourier Transform

Fourier Transform



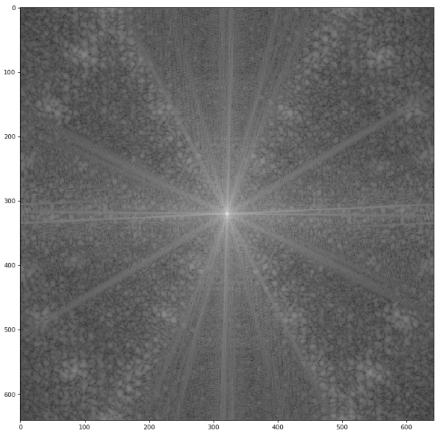
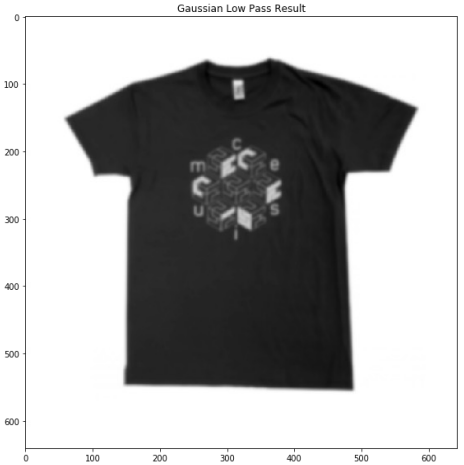
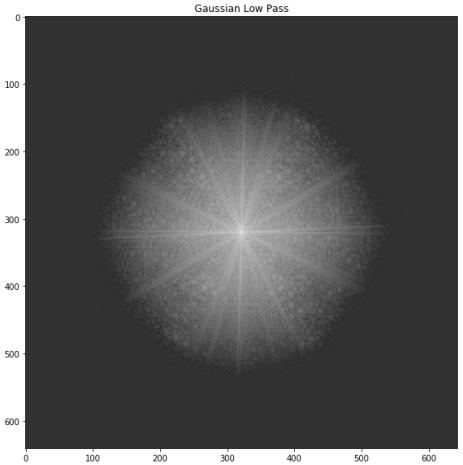
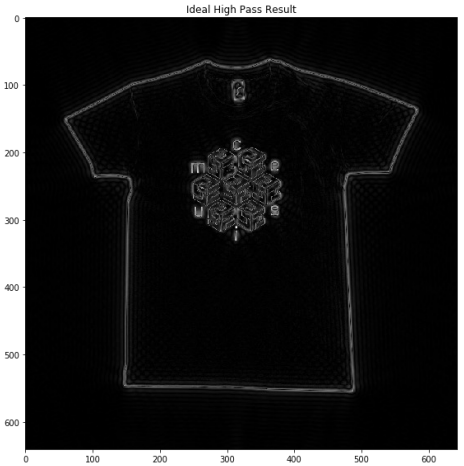
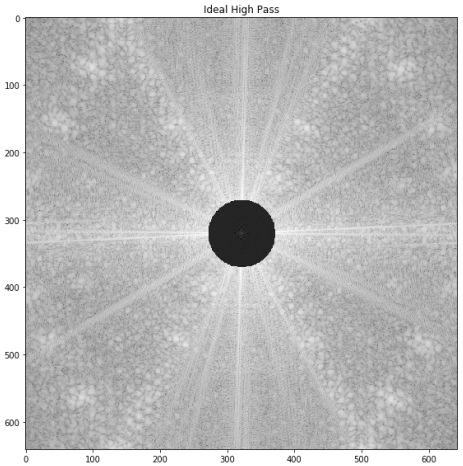


Image Processing with Fourier Transform





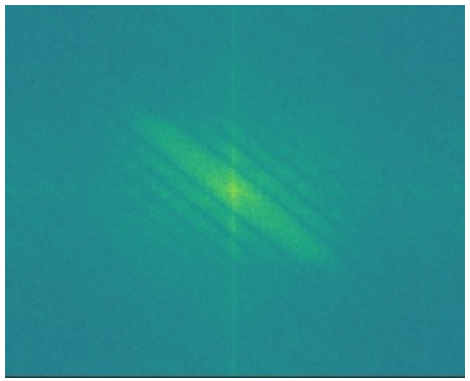




Filtering and Image Features

Deconvolution

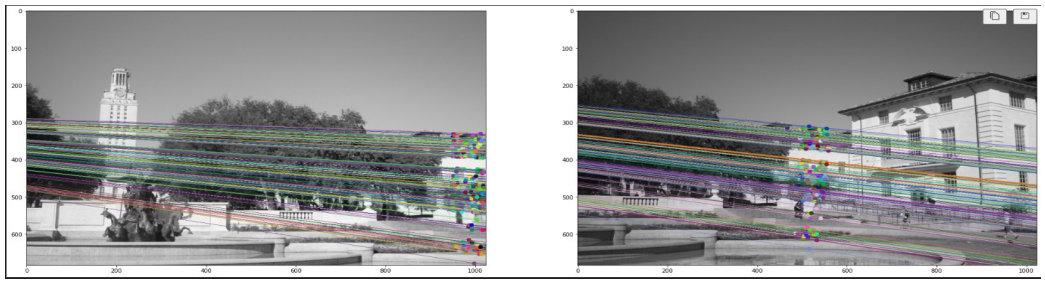
Fourier Transform



Point Spread Function

SIFT Feature Detection

Scene Geometry



Computer Vision with Deep Learning

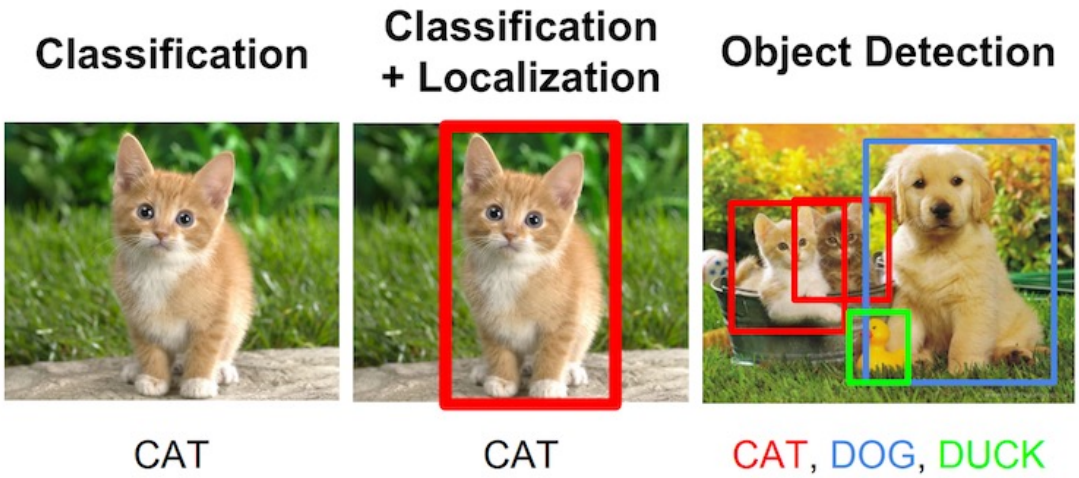


Image from: Stanford Convolutional Neural Networks for Visual Recognition Course
http://cs231n.stanford.edu/

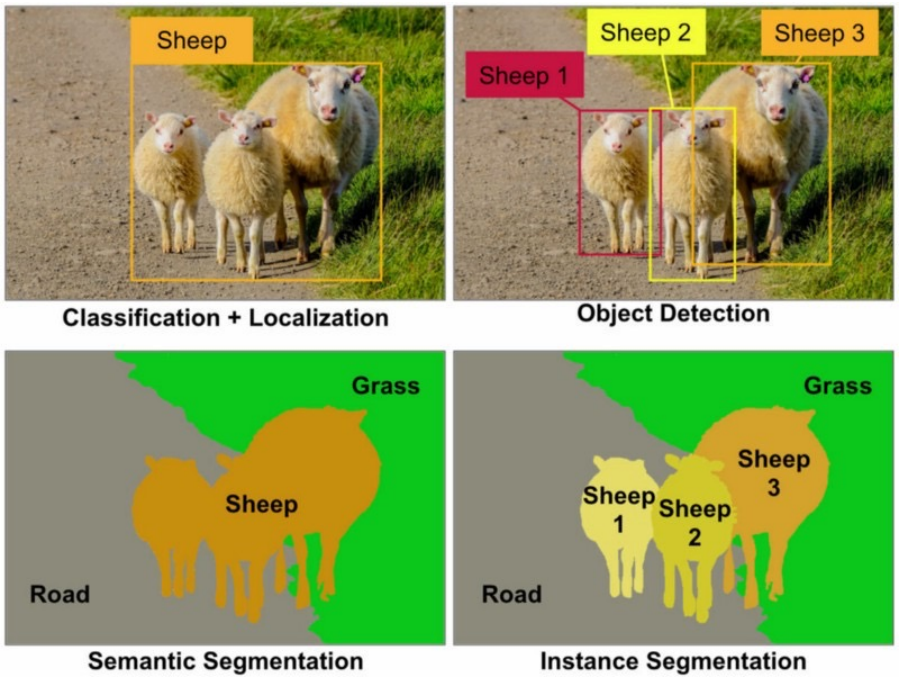


Image from: Detection and Segmentation through ConvNets, Towards Data Science
https://towardsdatascience.com/detection-and-segmentation-through-convnets-47aa42de27ea

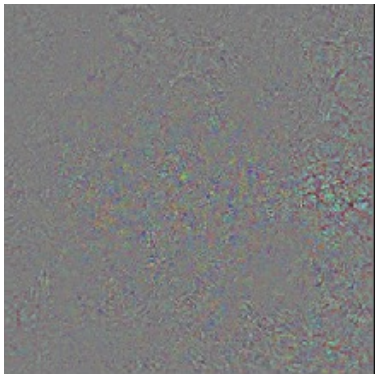
Deep Learning – Issues

Adversarial Examples

lynx 55.9%

+

noise
max % 0.043



=

cauliflower 99.5%

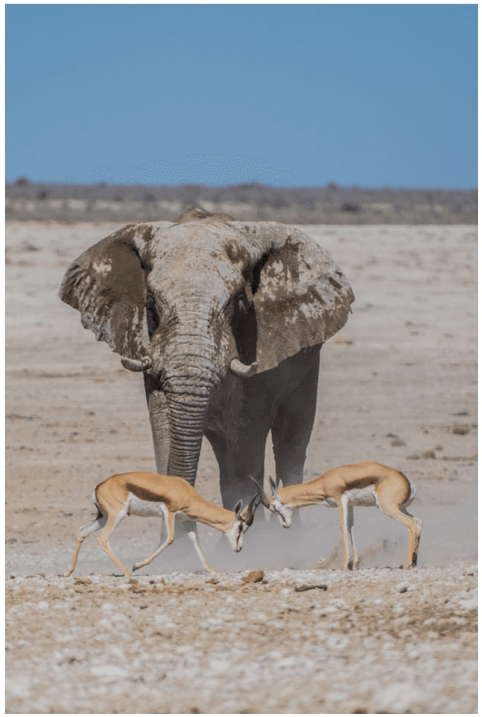
The right image looks as a cat to a person, but gets misclassified with high confidence by the NN

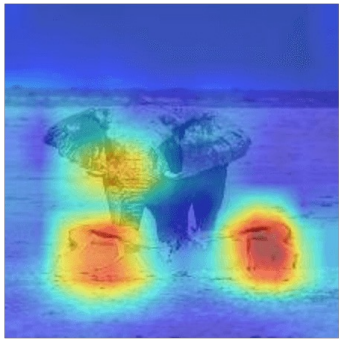
Deep Learning Visualization

Deep Dream

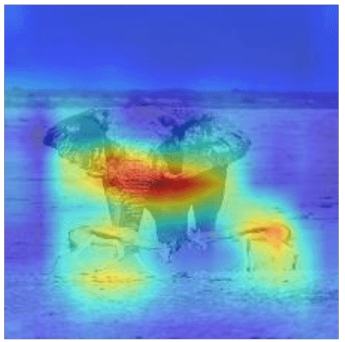
Style Transfer

Model Visualization





gazelle



elephant

Image from: "*Visualizing Neural Networks' Decision-Making Process", Towards data science*

Deep Learning – 3D Reconstruction

Photogrametry, NERFs and Gaussian Splatting

Images from: InstantNGP and “3D Gaussian Splatting: Performant 3D Scene Reconstruction at Scale”

Deep Learning – Generative AI

Stable Diffusion

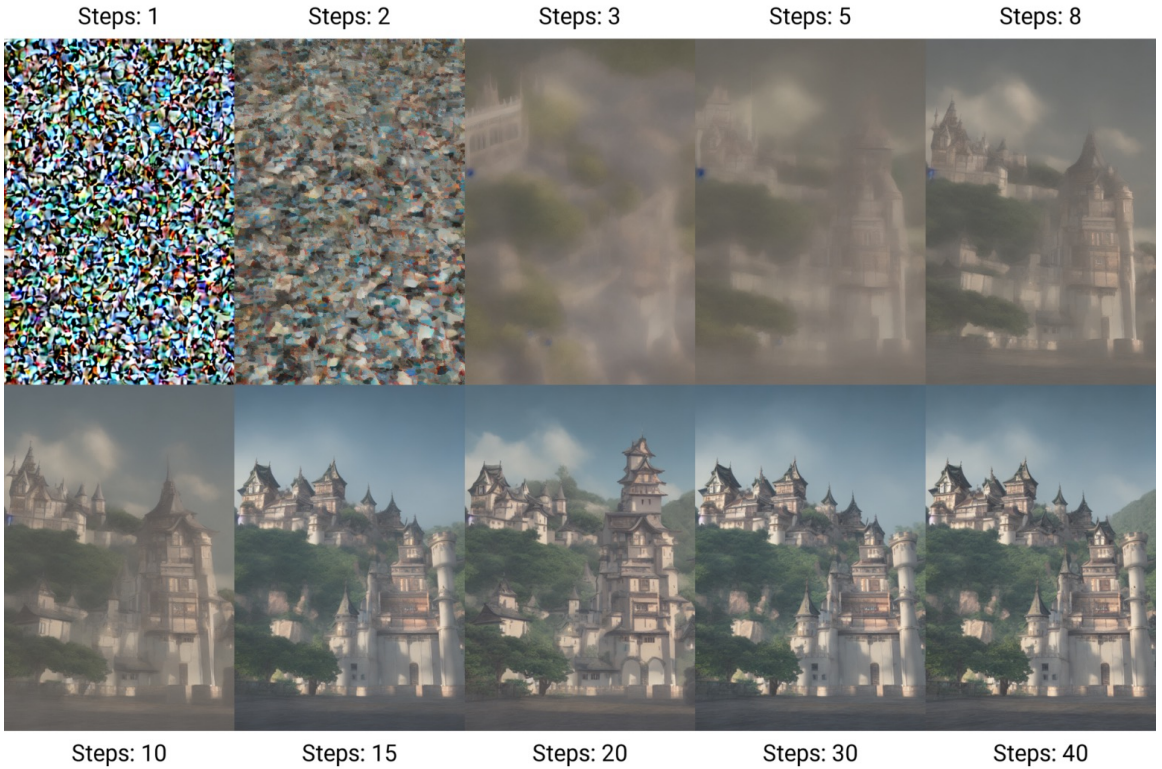
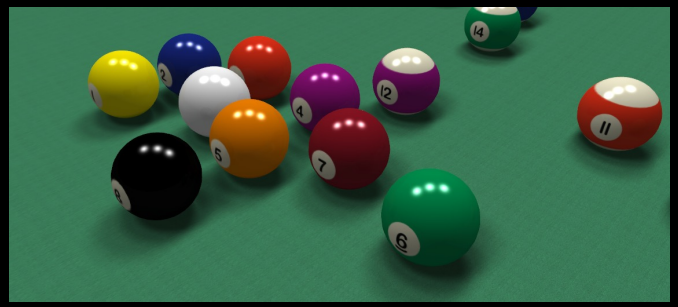
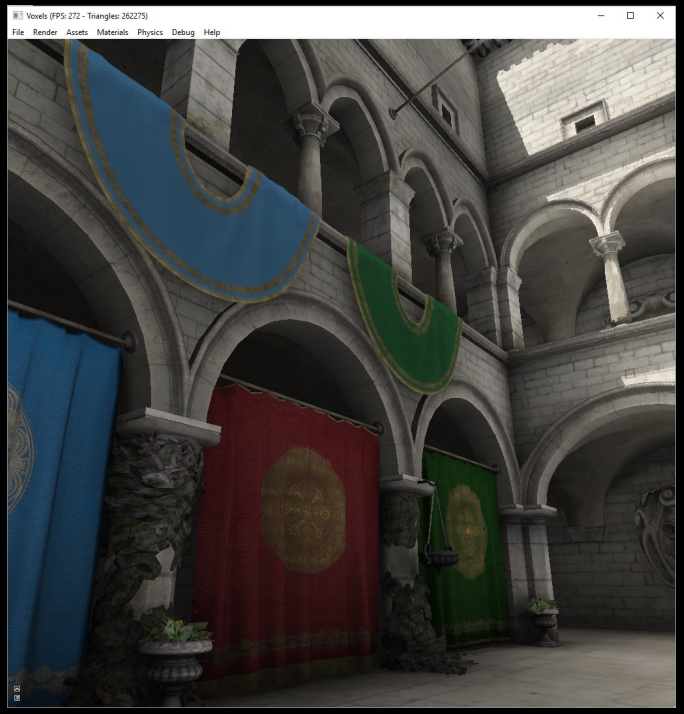


Image from https://en.wikipedia.org/wiki/Stable_Diffusion

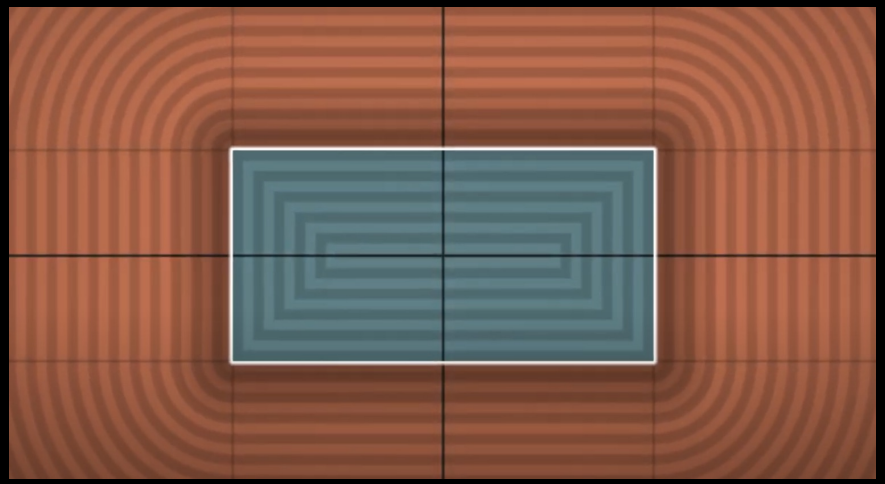
And now for something completely different …

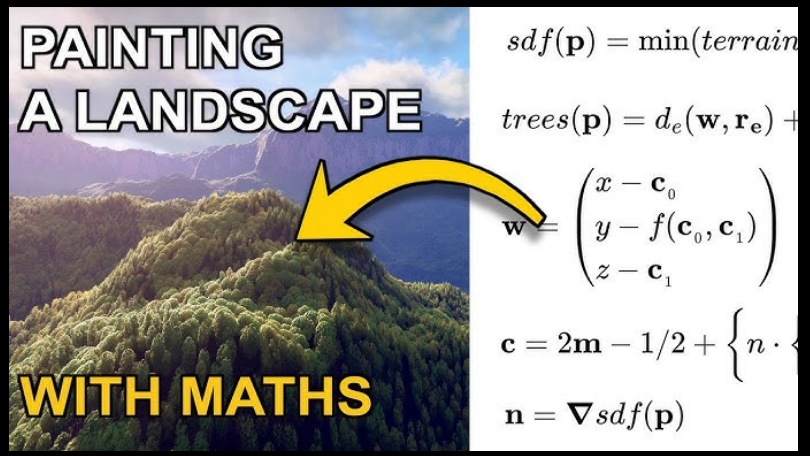
Rasterization
- Shader Programing





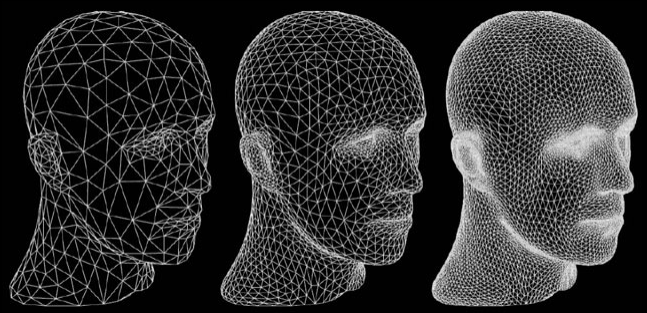
Hybrid Rasterization
- Signed Distance Functions





Imagens: Inigo Quilez

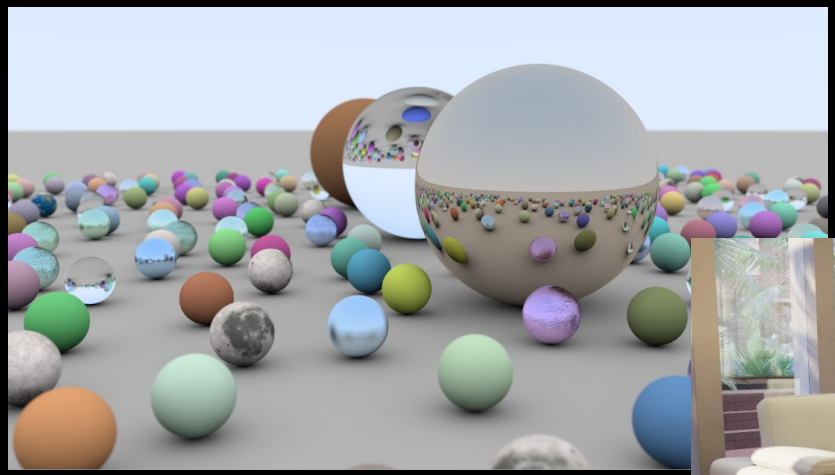
Rasterization AND Ray-Tracing



- Tessellation and geometry manipulation can be easily performed in a triangle/vertex based pipeline

- Illumination provides better results in a ray based pipeline
- DXR: Microsoft's all in one solution: Rasterization and Ray-Tracing in the same package
- OpenGL + Optix: NVIDIA's Optix is a ray-tracer that integrates well with OpenGL

Global Illumination Algorithms



Going full circle

- Main issue with Ray-Tracing:
  - To make it real time we can only shoot 1 or 2 rays per pixel
  - This produces a very noisy image
  - Deep Learning Denoiser for Ray-Tracing ;-)

Perfil CG

Docentes:

- António Ramires Fernandes (arf@di.uminho.pt)
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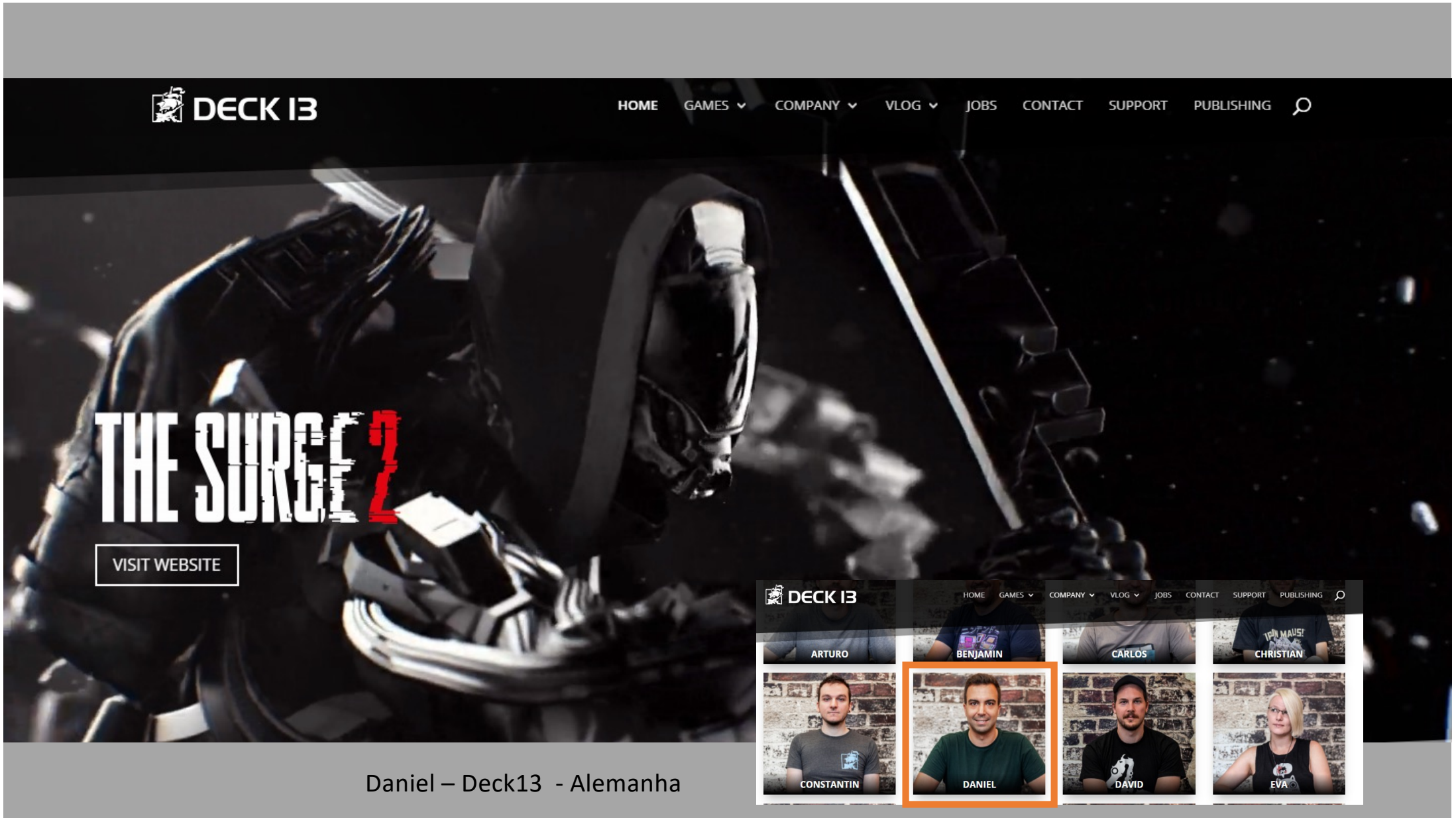
Processamento de Imagem e Visão por Computador (ARF + LPS)

Iluminação e Visualização (LPS)

Visualização em Tempo Real (ARF)

Ex-alunos do Perfil CG na industria de jogos



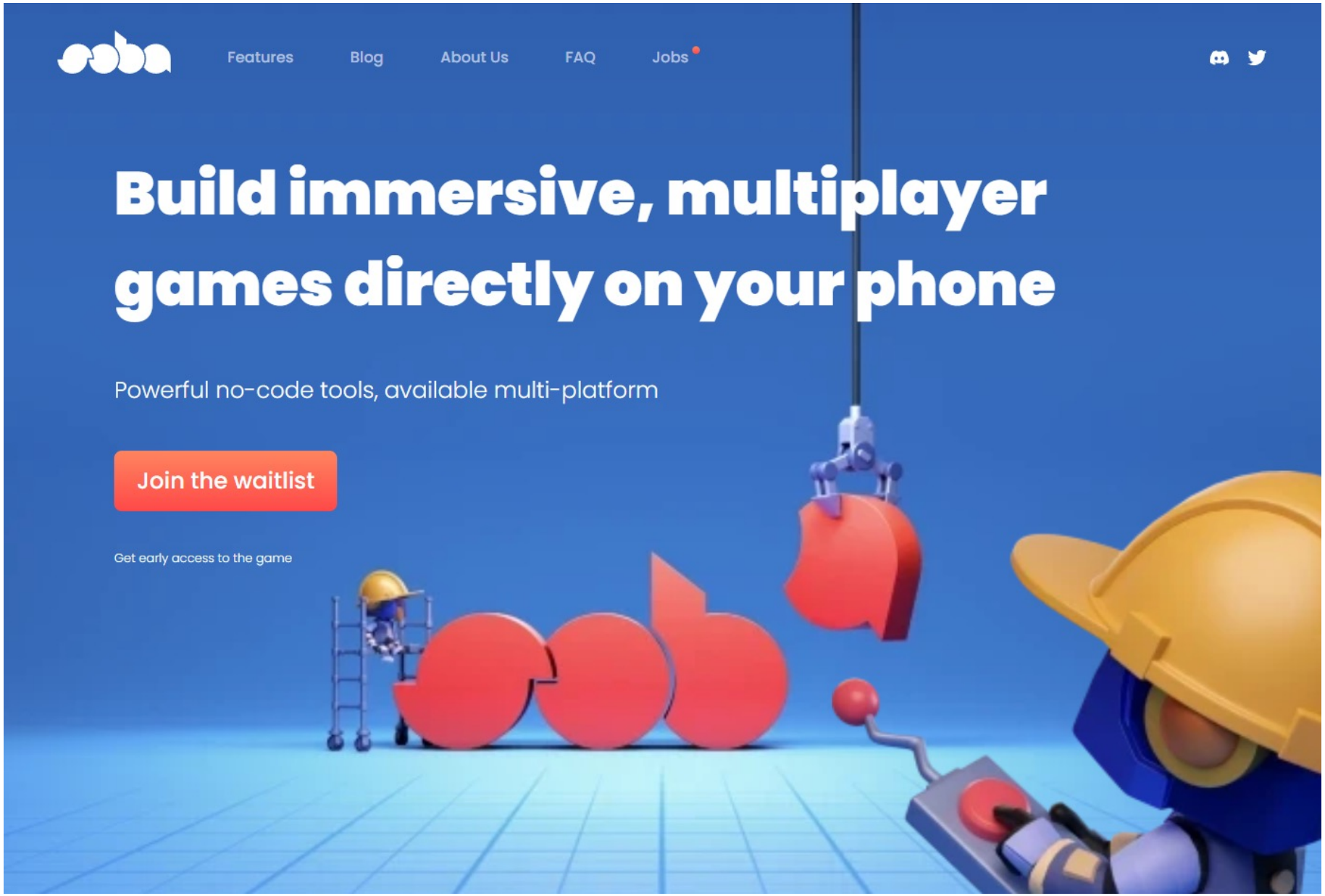
Daniel – Deck13 - Alemanha

Miguel Carvalho
Cloud Interactive
UK

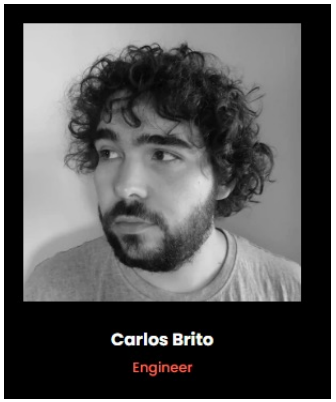
Nov 10, 2021

Announcements

Cloud Imperium Games to Open New Videogame Development Studio in Manchester, UK, in 2022



Carlos Brito
SOBA
Alemanha



ABOUT

Saber Interactive is a U.S.-based developer and publisher of video games. Consisting of over 20 studios and more than 2,500 employees worldwide, we are one of the key operative business units of Embracer Group.

Creating and/or publishing games for all major platforms based on original and licensed IPs, Saber's current and upcoming titles include Warhammer 40,000: Space Marine 2, World War Z, Evil Dead: The Game, SnowRunner and A Quiet Place. Founded in 2001, Saber is also known for two decades of development partnerships with AAA publishers, producing The Witcher 3: Wild Hunt for Nintendo Switch, Halo: The Master Chief Collection, Crysis Remastered, and many others.

To stay in the loop on all of our upcoming announcements, please make sure you're following Saber across our official social channels.

César Perdigão
Saber Interactive
Vila do Conde

Perfil CG

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