
SAMSUNG
Research
Russia

# NDA

# Global R&D Networks

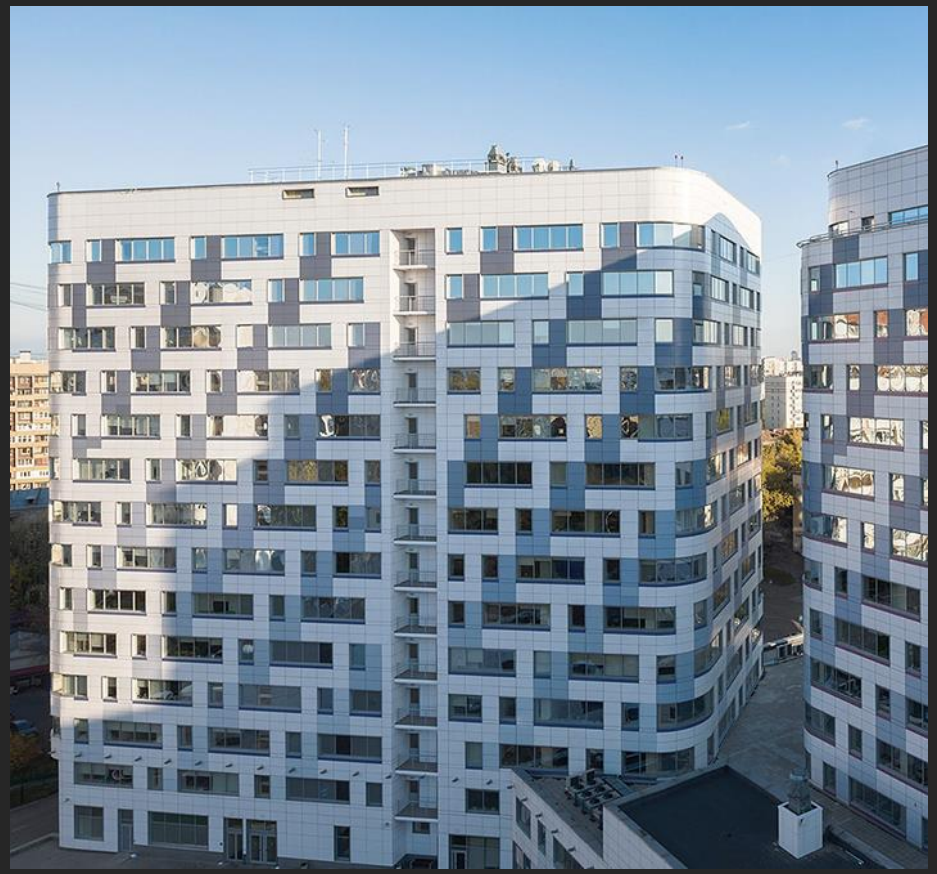
14 R&D Centers and 7 AI Centers worldwide

**Global R&D Centers** —

- America
- Europe/CIS/Middle East
- Southwest/Southeast Asia
- China
- Japan

**Global AI Centers** +

# Samsung Research Russia



Algorithm Research

Media Processing

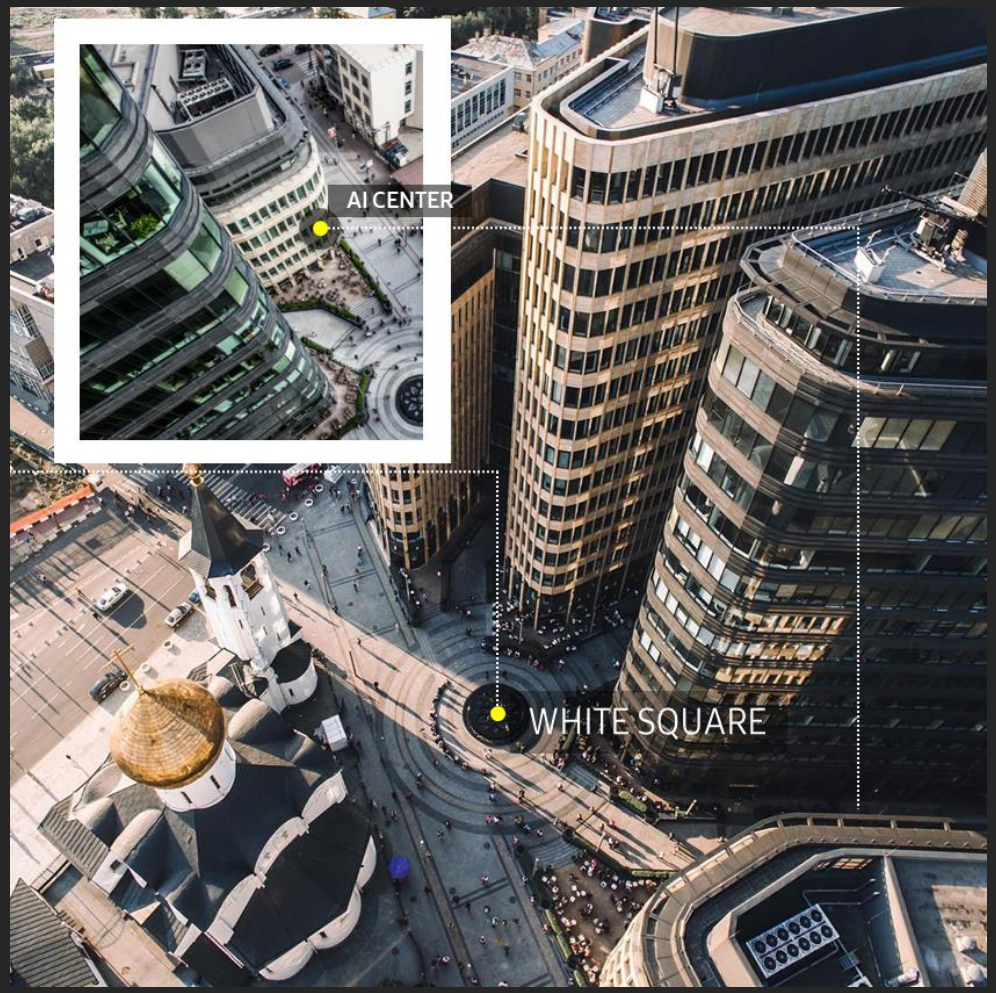
Applied Intelligence

Deep System

Optics

Business Development

# Samsung AI Center - Moscow



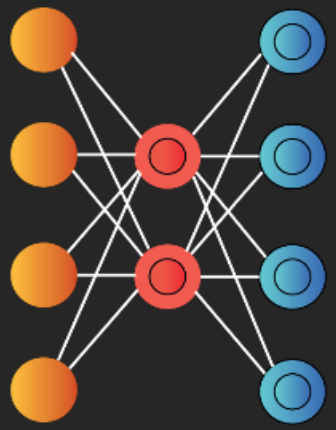

Computer Vision

Telepresence

AI Core Platform

User Data Analytics

https://thenounproject.com/

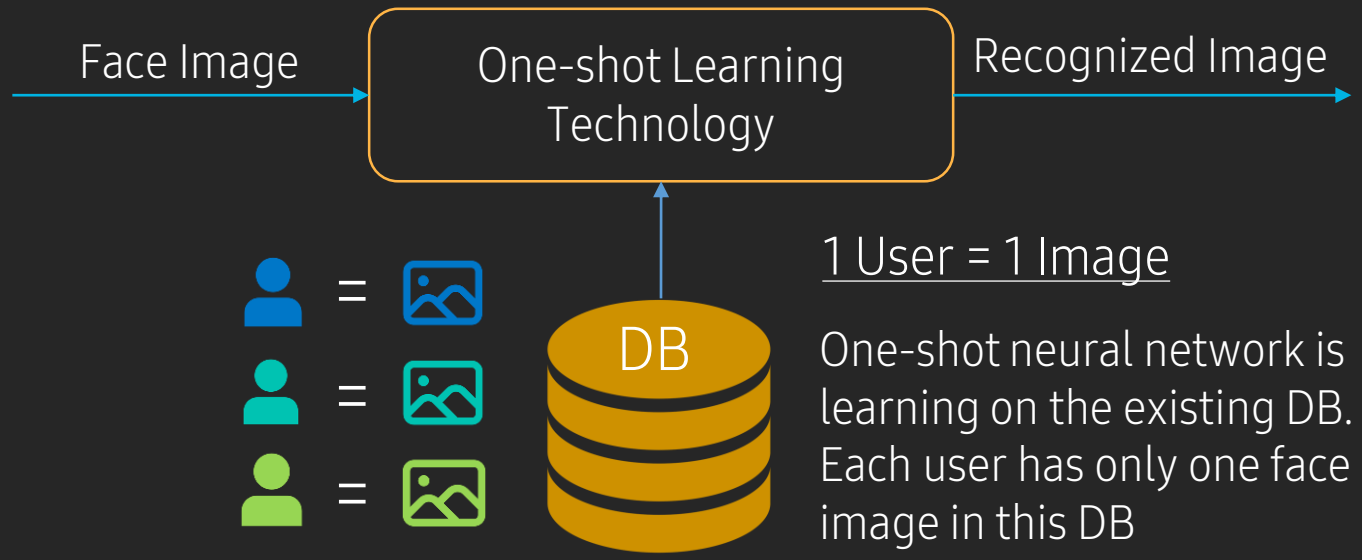


# One-shot Learning

Applied Intelligence Team

# One-shot Learning

Fast face detection and face recognition technology based on machine learning classification algorithms




1 User = 1 Image

One-shot neural network is learning on the existing DB. Each user has only one face image in this DB

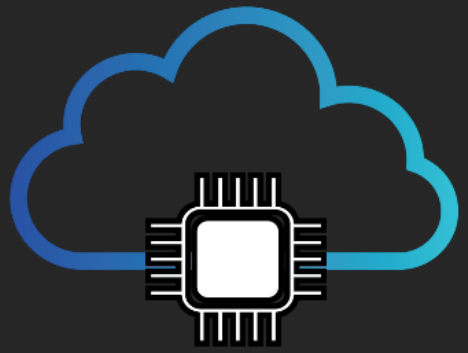
## TOP 5 Use-cases

1. Payments
2. Access and security
3. Criminal identification
4. Advertising
5. Healthcare

## Advantages:

+ Compact – 16Mb Footprint
+ Accurate – 98% Recognition Rate

Samsung AI Center Moscow employees use One-shot Learning for conference rooms reservation



# Frame Rate Up-Conversion

Media Processing Team

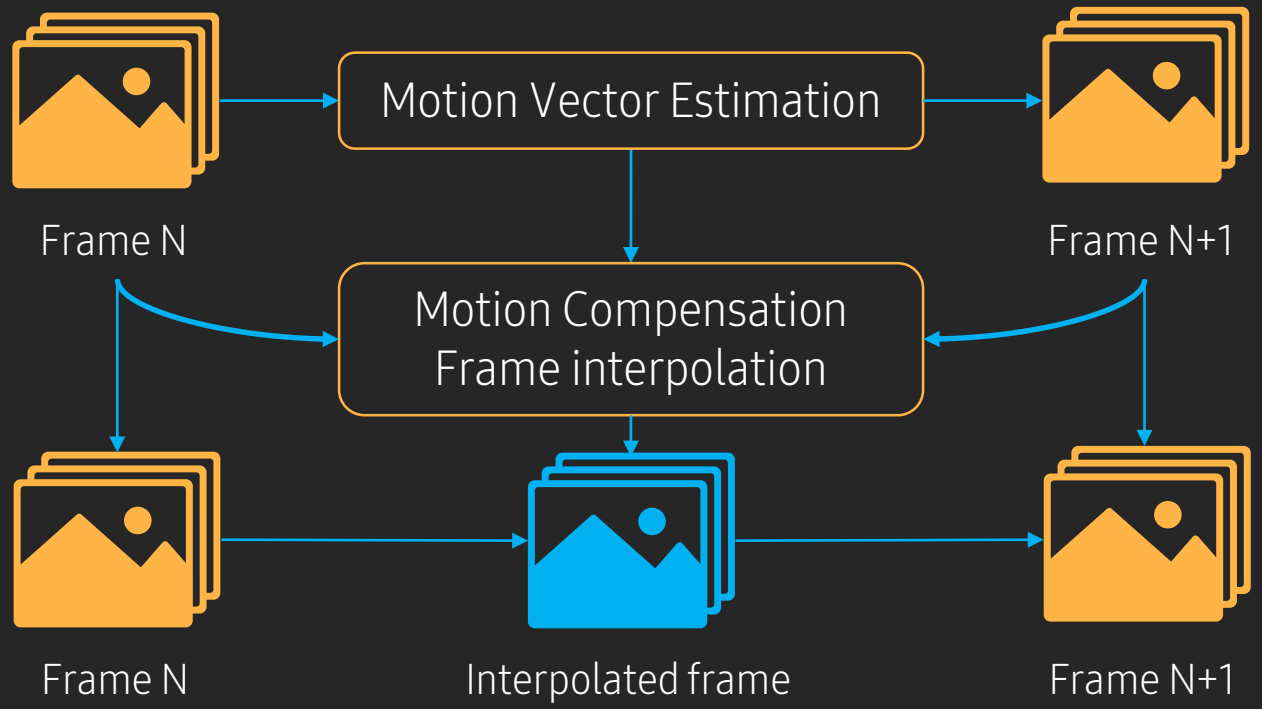
https://www.researchgate.net/publication/325741084_Real-time_3DRS_motion_estimation_for_frame-rate_conversion

# SRR SOLUTION INCREASES CAMERA FRAMERATE X2


Super SlowMotion

# Frame Rate Up-Conversion on Mobile

Real-time SW algorithm (CPU + GPU) for smoother playback used in **Super Slow Motion** camera regime and **Motion Photo** video player




## Advantages

+ World first SW FRC on mobile
+ Supported video formats up to FHD+ (2224x1080)
+ Real-time conversion 15 → 30 FPS (frames per second), offline 480 → 960 FPS
+ Overall power consumption < 500mA

The algorithm is implemented in flagship models up to Samsung Galaxy S10/S10+ and Note 10/10+

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# Human Pose Estimation

## Vision, Learning & Telepresence Lab

saic-violet.github.io/learnable-triangulation
arxiv.org/abs/1905.05754
youtu.be/z3f3aPSuhqg

# Demo

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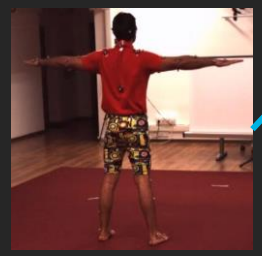
- Moscow

# Learnable Triangulation

A new approach for human pose localization in 3D from multiple images

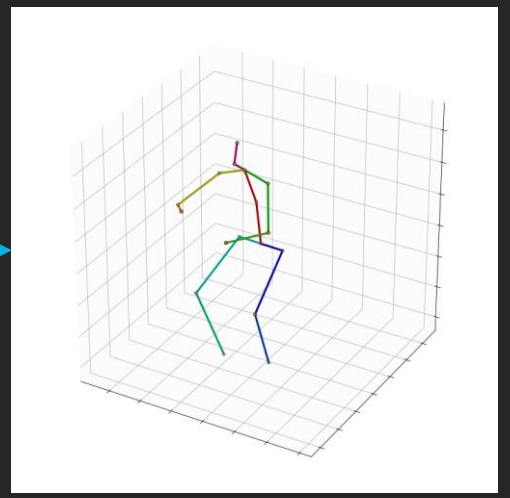
Model #1 – algebraic (spoiler: no 3D human pose prior ☹)

1st camera



Nth camera

NN magic: differentiable algebraic triangulation with an addition of confidence weights estimated from the input images



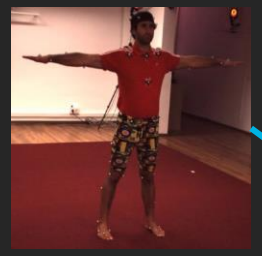
3D pose

## TOP Use cases

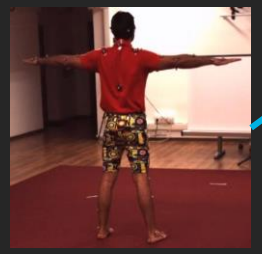
1. Motion Capture for movies/games production
2. Human-Computer interface
3. Telepresence
4. Surveillance

# Learnable Triangulation

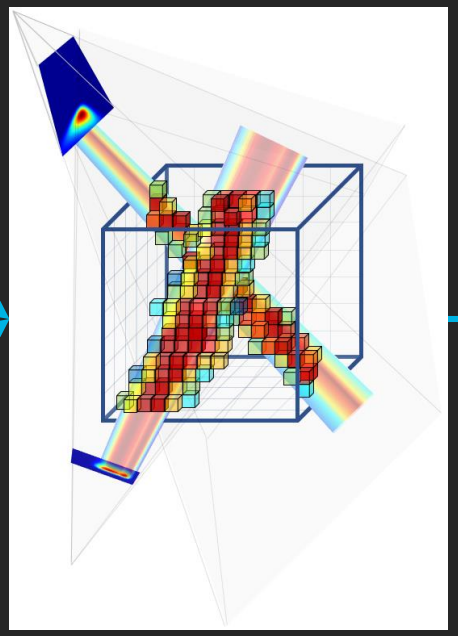
A new approach for human pose localization in 3D from multiple images
Model #2 – volumetric (based on volume unprojection)



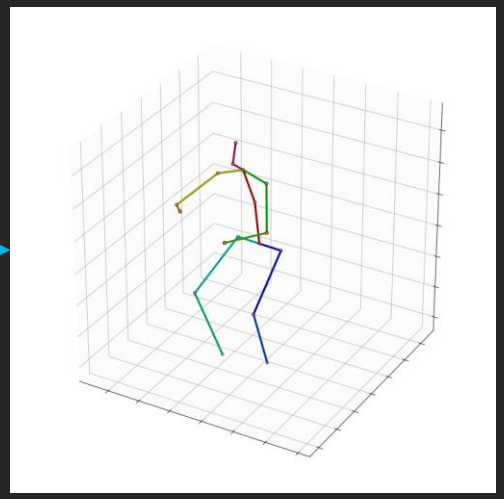
1st camera



Nth camera



2D backbone feature maps →
Refinement via 3D convolutions →
Final 3D joint heatmaps



3D pose

## Advantages:

+ Surpassed previous SOTA ~2.5 times on Human3.6M dataset
+ Our method is able to produce accurate and smooth 3D poses without any markers

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# Neural Point-Based Graphics

Vision, Learning & Telepresence Lab

arxiv.org/abs/1905.05754
dmitryulyanov.github.io/neural_point_based_graphics
youtu.be/7s3BYGok7wU

# Demo

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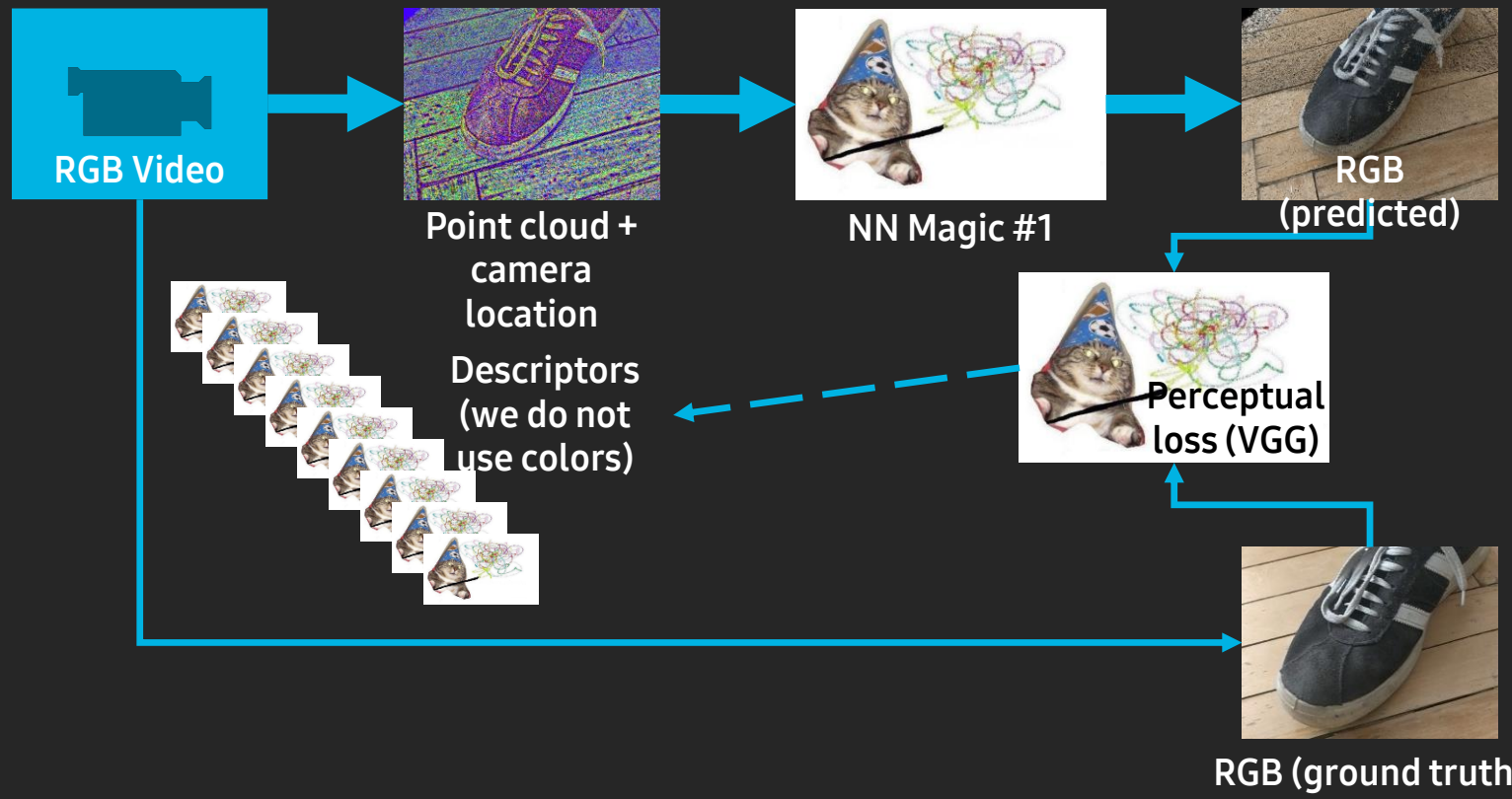
- Moscow

# Neural Point-Based Graphics

New point-based approach for modeling complex scenes from different viewpoints

Stage 1: Training




## TOP Use cases

1. E-marketing
2. Real estate
3. Street view
4. VR
5. Telepresence

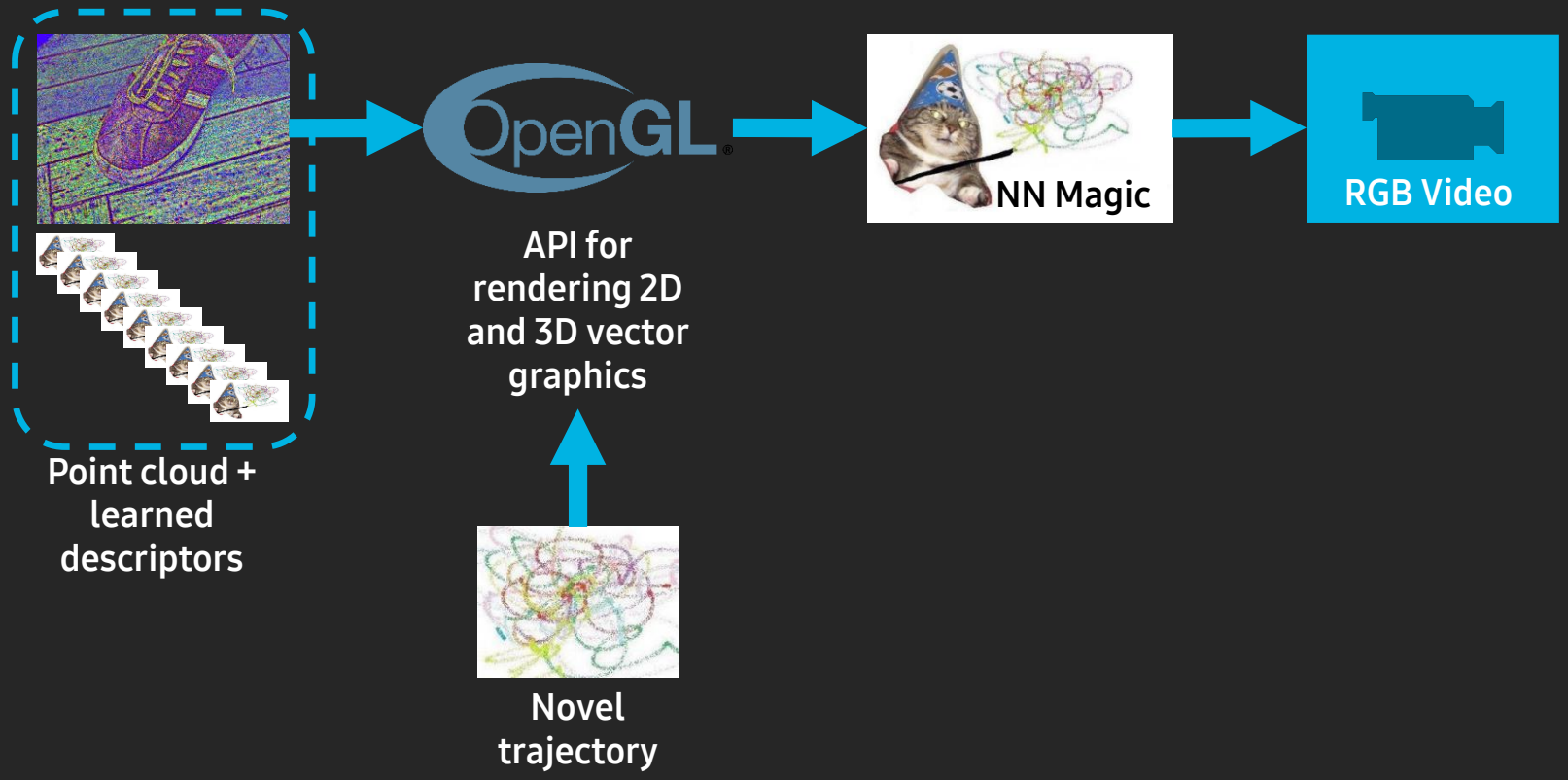
## Advantages:

+ No competitors
+ RGB video: HD30k on 1080ti

# Neural Point-Based Graphics

New point-based approach for modeling complex scenes from different viewpoints

Stage 2: Test (based on photogrammetry)



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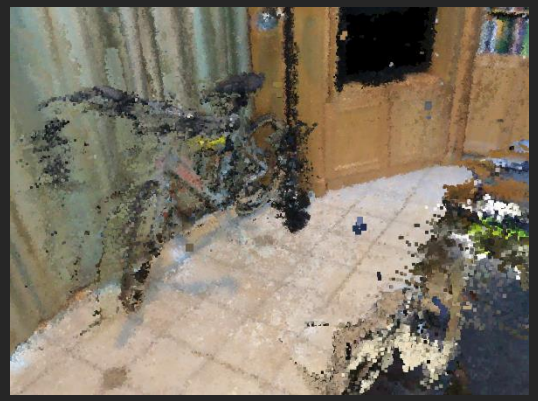
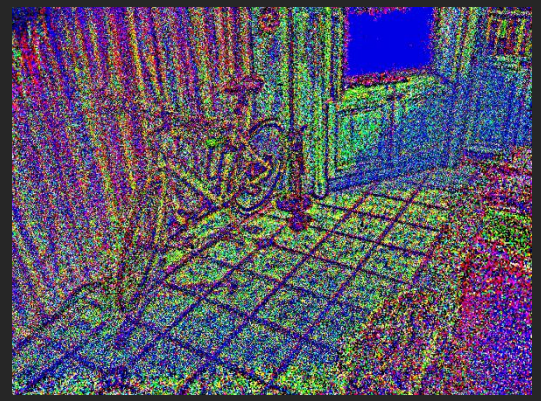
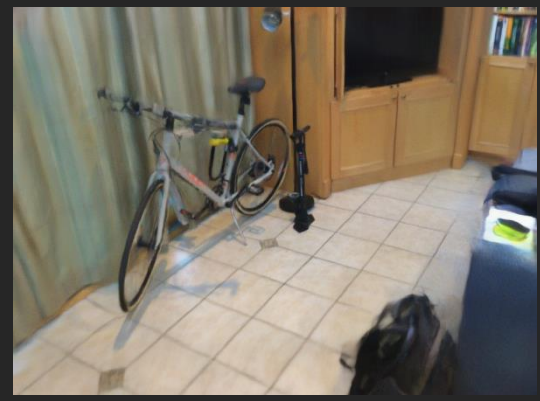
# Neural Point-Based Graphics

New point-based approach for modeling complex scenes from different viewpoints







Source point cloud

Learned descriptors

NN output

# Thank you!

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