How AI helps creating 3D materials from photography with Substance

Rosalie Martin, Senior Software Engineer
Baptiste Manteau, Product Owner Substance Alchemist

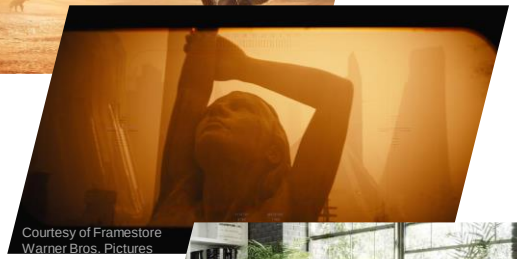
THE INDUSTRY STANDARD FOR MATERIAL CREATION AND TEXTURING

Art by Omar Taher, based on a concept by Jeff Delgado

THE STANDARD IN

Video Game


Courtesy Ubisoft


Courtesy of Framestore
Warner Bros. Pictures

VFX/Animation

Architecture


Art by Darío Andrés

Industrial Design

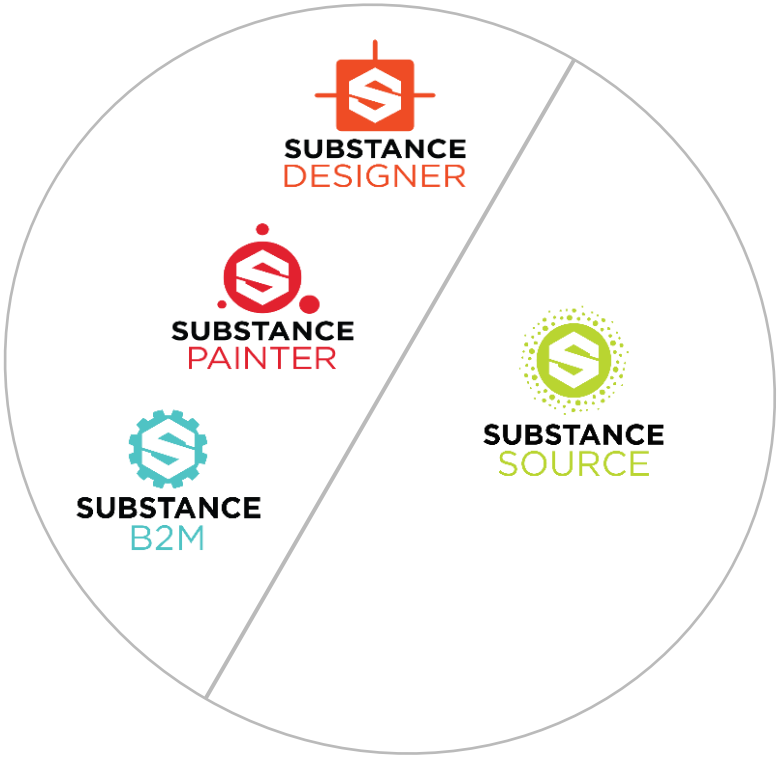

Art by Josip


RENAULT
JAGUAR
LAND ROVER
VOLVO
BMW
HYUNDAI
GM
Mercedes-Benz
HONDA
TOYOTA
TATA
DAIHATSU
burrows
ROTOR STUDIOS
MACKEVISION
estech
SMALLDOTS
ZeroLight
KISKA.
Valeo
faurecia
CATERPILLAR
POLARIS INDUSTRIES INC.
FedEx
ALSTOM
thyssenkrupp
Allseas
Technip
ExxonMobil
DASSAULT AVIATION
AIRBUS
BOEING
BOMBARDIER AEROSPACE
NORTHROP GRUMMAN
NVIDIA.
htc
SAMSUNG
QUALCOMM
verizon
PHILIPS
intel
FUJITSU
PUBLICIS GROUPE
SAATCHI & SAATCHI
Booz | Allen | Hamilton
McCANN
ogilvy
Torch TECHNOLOGIES
RAYDON
NASA
QinetiQ
Raytheon
SAIC
Redefining Ingenuity
Capgemini
accenture
High performance. Delivered.
Aquent
ALTRAN
IDEO
TEAGUE
Microsoft
snapchat
Google
facebook
RedBull
playmobil
Hasbro
Ashley HOMESTORE
HermanMiller
wayfair
houzz
IKEA
THE HOME DEPOT
LOWE'S
amazon
P&G
overstock.com
shopify
BOSS HUGO BOSS
ESPRIT
adidas
DECATHLON
KEEN
vf
LUXOTTICA
HUBLOT
BURBERRY LONDON
LOUIS VUITTON
TIFFANY & Co.

OUR COMMUNITY

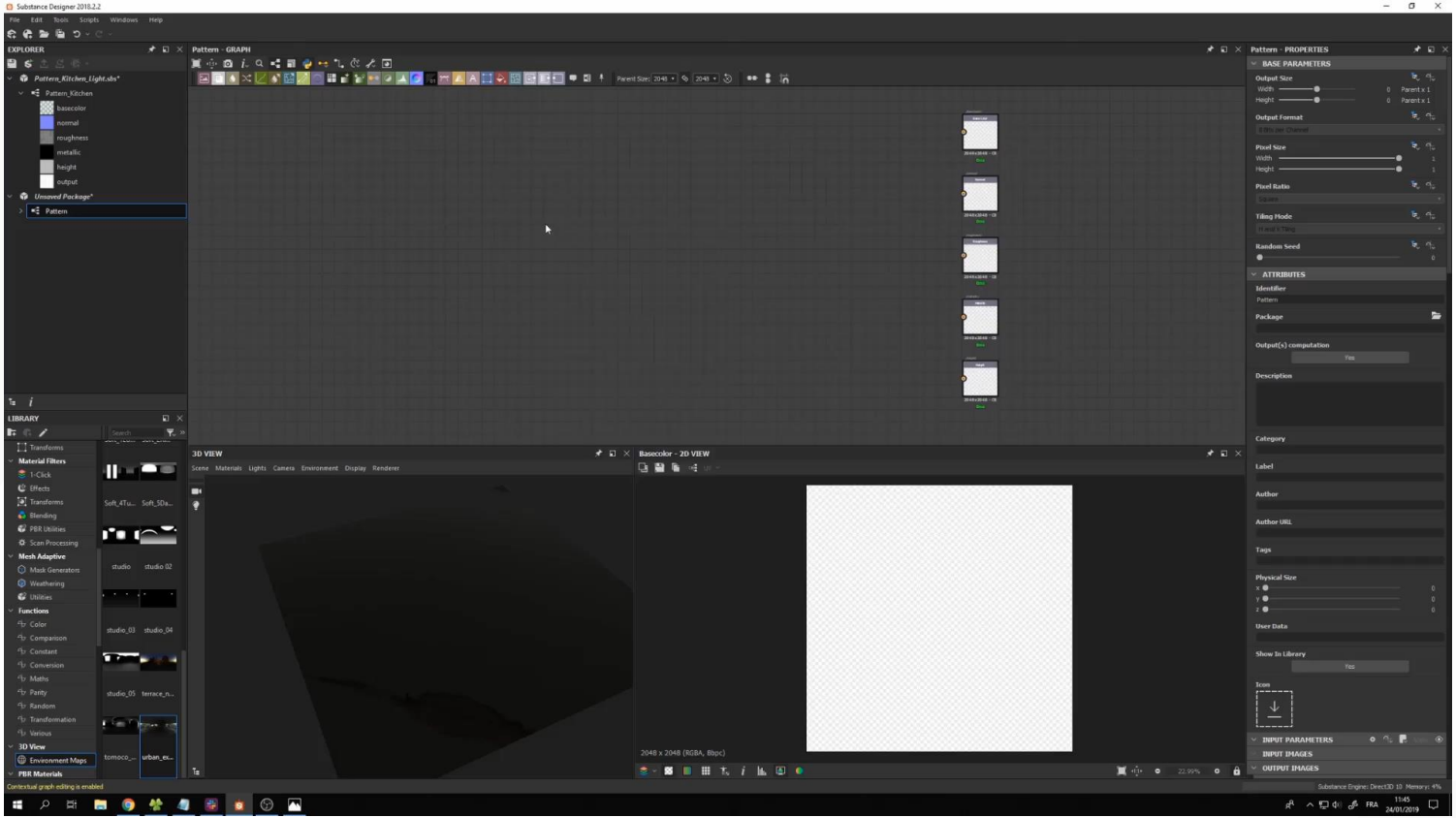
A COMPREHENSIVE TOOLSET

SOFTWARE

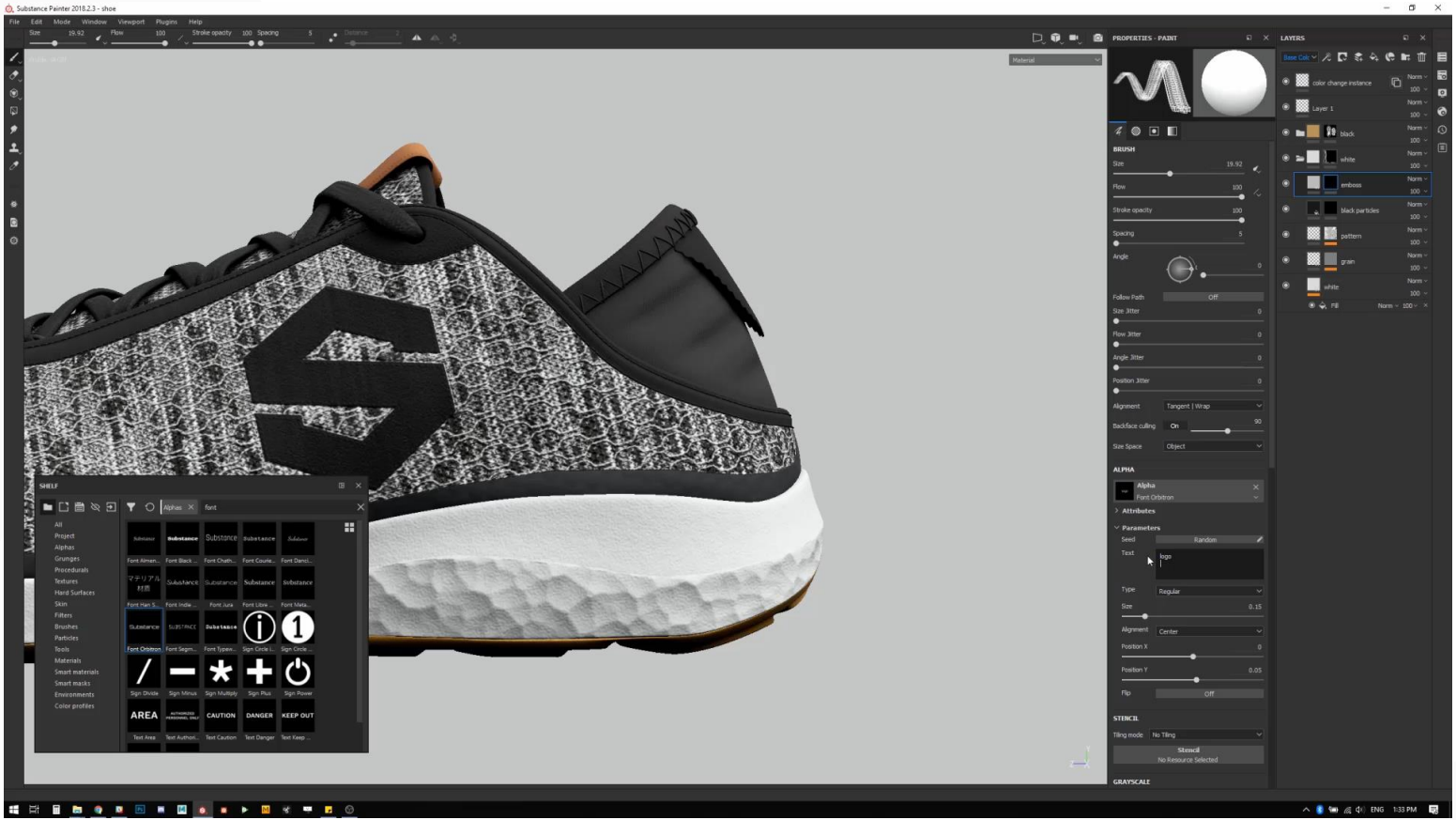


CONTENT

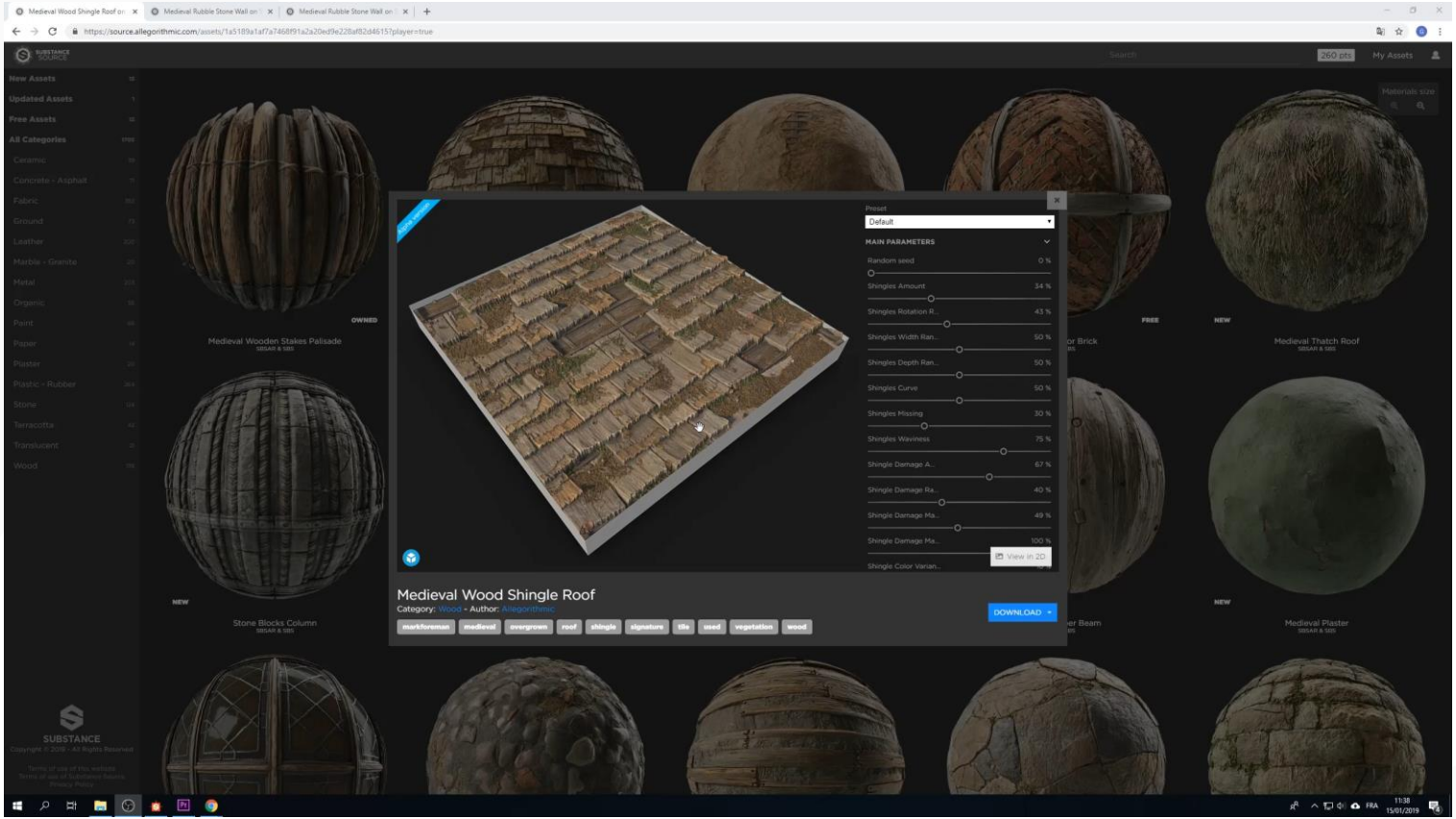
SUBSTANCE DESIGNER : MATERIAL CREATION SOFTWARE



SUBSTANCE PAINTER : 3D PAINTING



SUBSTANCE SOURCE : THE PBR MATERIALS LIBRARY



SUBSTANCE

Substance parametric materials are supported by all major engines and tools

It is the industry standard for PBR materials in real-time and raytracing.

GAME ENGINES

UNREAL ENGINE

unity

CRYENGINE

and more...

MODELING & ANIMATION

MAYA

3DS MAX

CINEMA 4D

MODO

CATIA

Houdini

and more...

RENDERERS

NVIDIA Iray

V-ray

VRED

corona

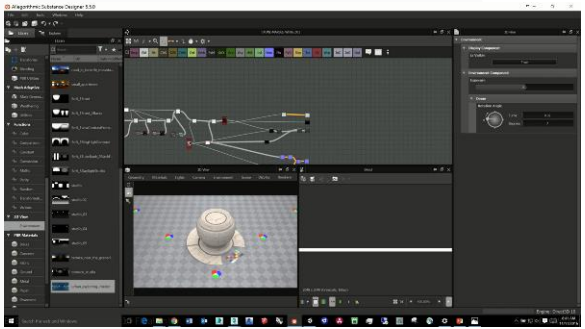
REDSHIFT

ARNOLD

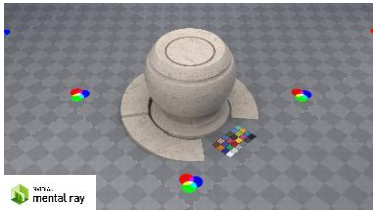
and more...

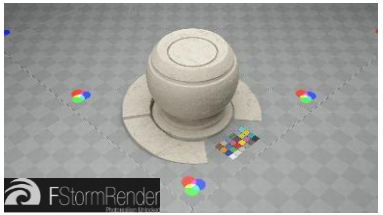
ONE SUBSTANCE FILE

MULTIPLE RENDERERS



SUBSTANCE





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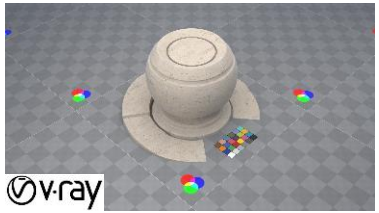

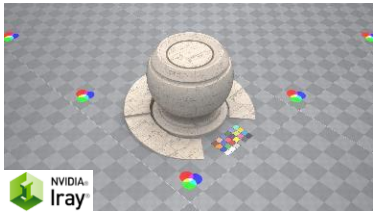

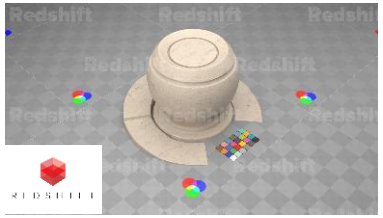

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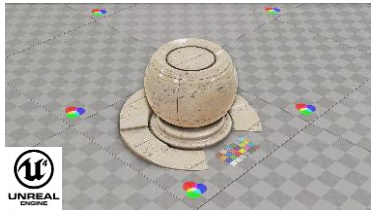
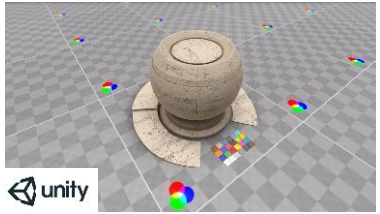
Raytraced

Real-Time





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Scott DeWoody, Firmwide Creative Media Manager for Gensler, masterclass on Procedural PBR Material Creation Using Substance Designer for Visualization

READY TO USE PARAMETRIC MATERIALS

MATERIALS CREATION & CAPTURE

READY TO USE PARAMETRIC MATERIALS

SUBSTANCE SOURCE

MATERIALS CREATION & CAPTURE

SUBSTANCE DESIGNER

SUBSTANCE B2M

UNIFIED MATERIAL LIBRARY

READY TO USE PARAMETRIC MATERIALS

SUBSTANCE SOURCE

MATERIALS CREATION & CAPTURE

SUBSTANCE DESIGNER

SUBSTANCE B2M

UNIFIED MATERIAL LIBRARY

3D MODEL TEXTURING

SUBSTANCE PAINTER

VR / AR EXPERIENCE

UNREAL ENGINE

VRED

...

SCENE RENDERING

3DS MAX

V-ray

...

READY TO USE PARAMETRIC MATERIALS

SUBSTANCE SOURCE

MATERIALS CREATION & CAPTURE

SUBSTANCE DESIGNER

SUBSTANCE B2M

SUBSTANCE ALCHEMIST

UNIFIED MATERIAL LIBRARY

LIBRARY MANAGEMENT

SUBSTANCE ALCHEMIST

3D MODEL TEXTURING

SUBSTANCE PAINTER

VR / AR EXPERIENCE

UNREAL ENGINE

VRED

...

SCENE RENDERING

3DS MAX

V-ray

...


SUBSTANCE
ALCHEMIST
Art by Josip Vrandecic

NEW STANDALONE PRODUCT IN THE SUBSTANCE ECOSYSTEM

Art by Josip Vrandecic

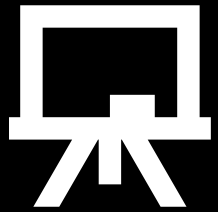

DEDICATED TO
AUGMENTED
MATERIAL CREATION
Art by Josip Vrandecic

SERVICES

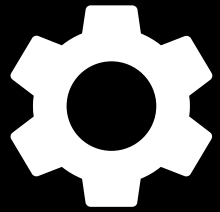
CREATE MATERIAL LIBRARIES

EXPLORE CONTENT

PIN YOUR IDEAS



MANAGE MATERIALS



OUR TARGET USERS

ArchViz Expert

Explore Libraries
Create Collections
Tweak Materials
Mix Materials
Render

3D Artist

Import Scans
Create Material
Hybrid Material
Manage

CMF Designer

Mood board
Browse Collections
Generate variations
Manage

Technical Director

Review
Compare
Batch
Manage

PROCEDURAL

CAPTURE

ARTISTRY

ARTIFICIAL INTELLIGENCE

Art by Josip Vrandecic

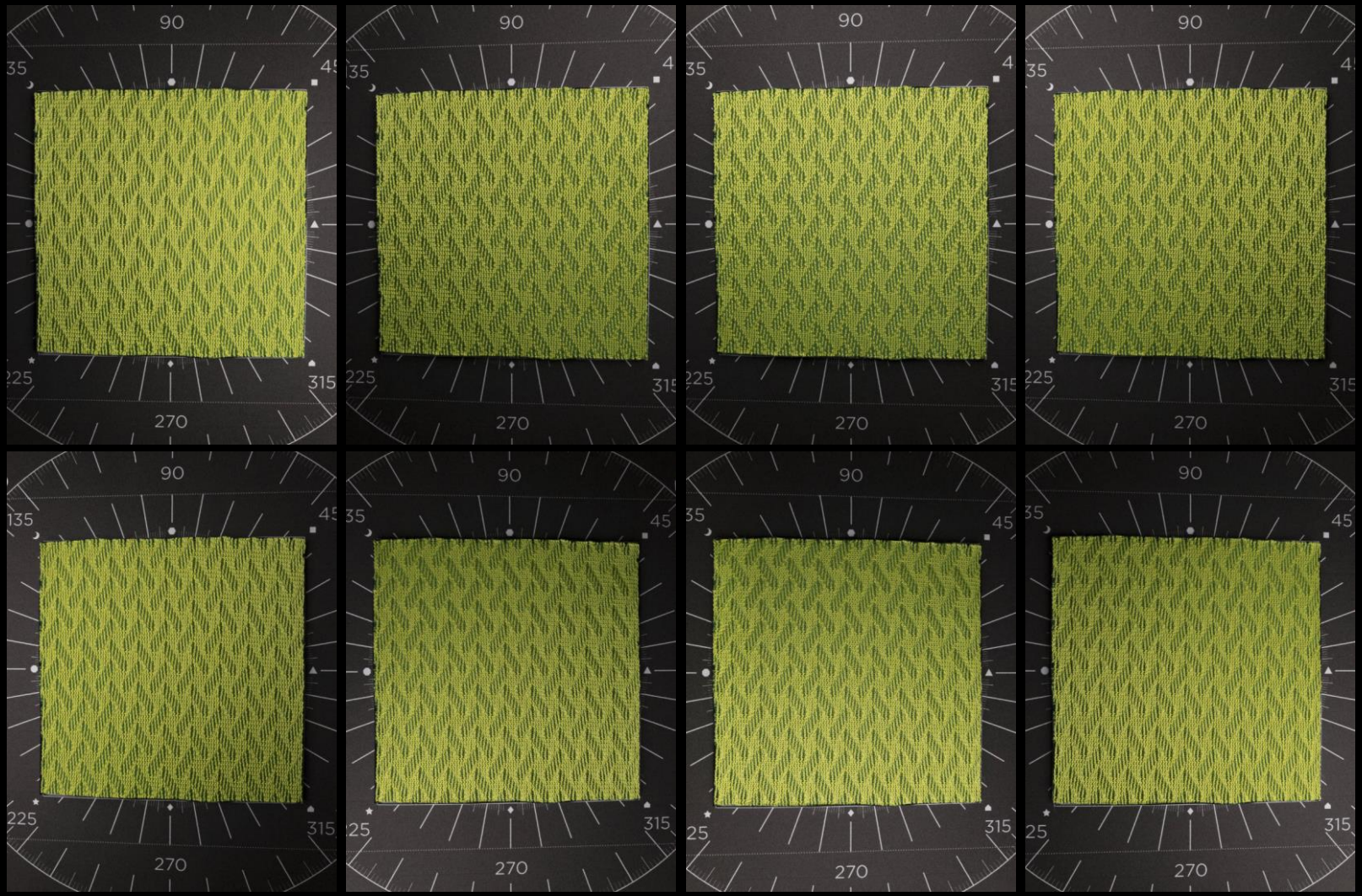
PROCEDURAL

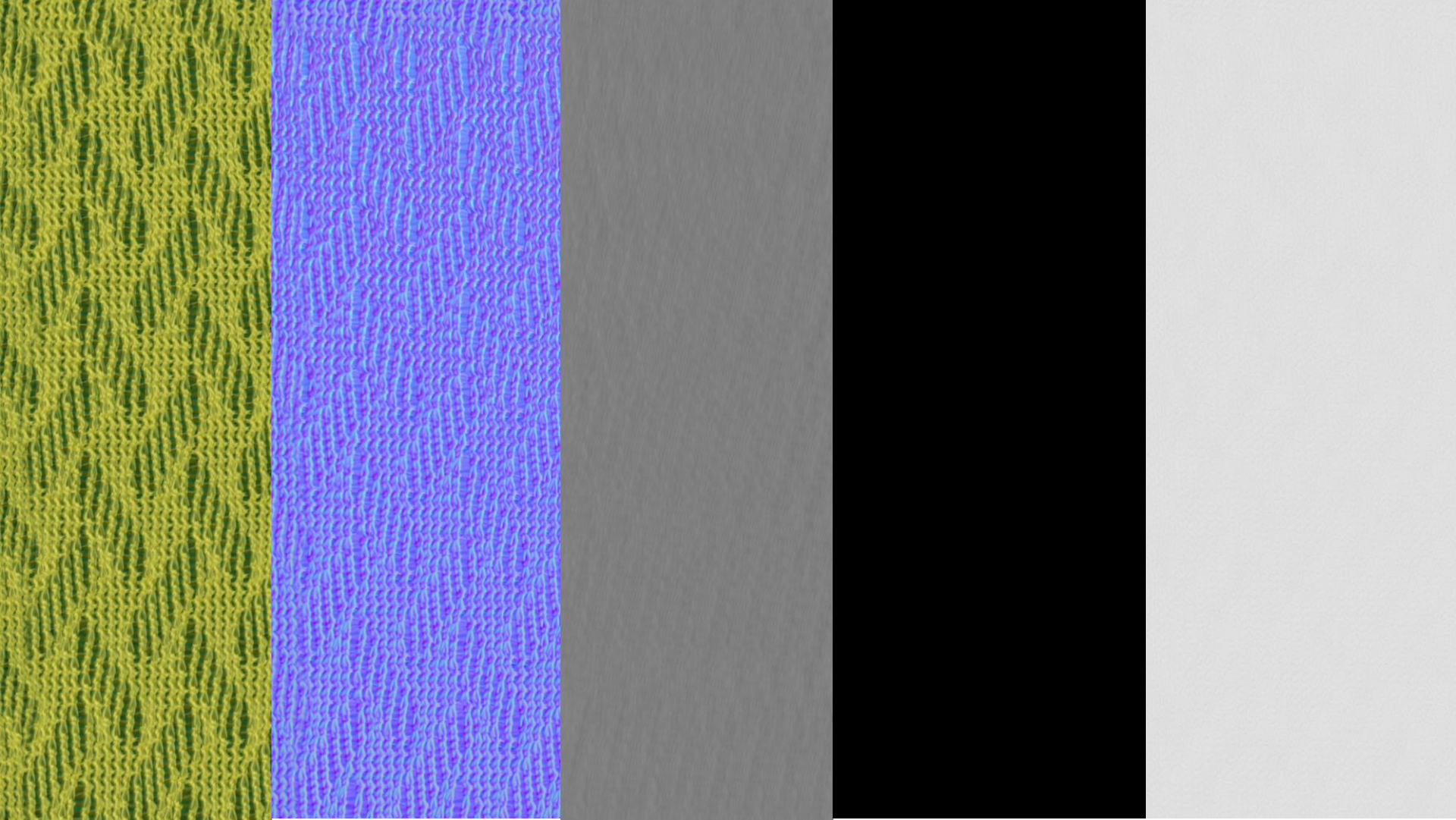
CAPTURE

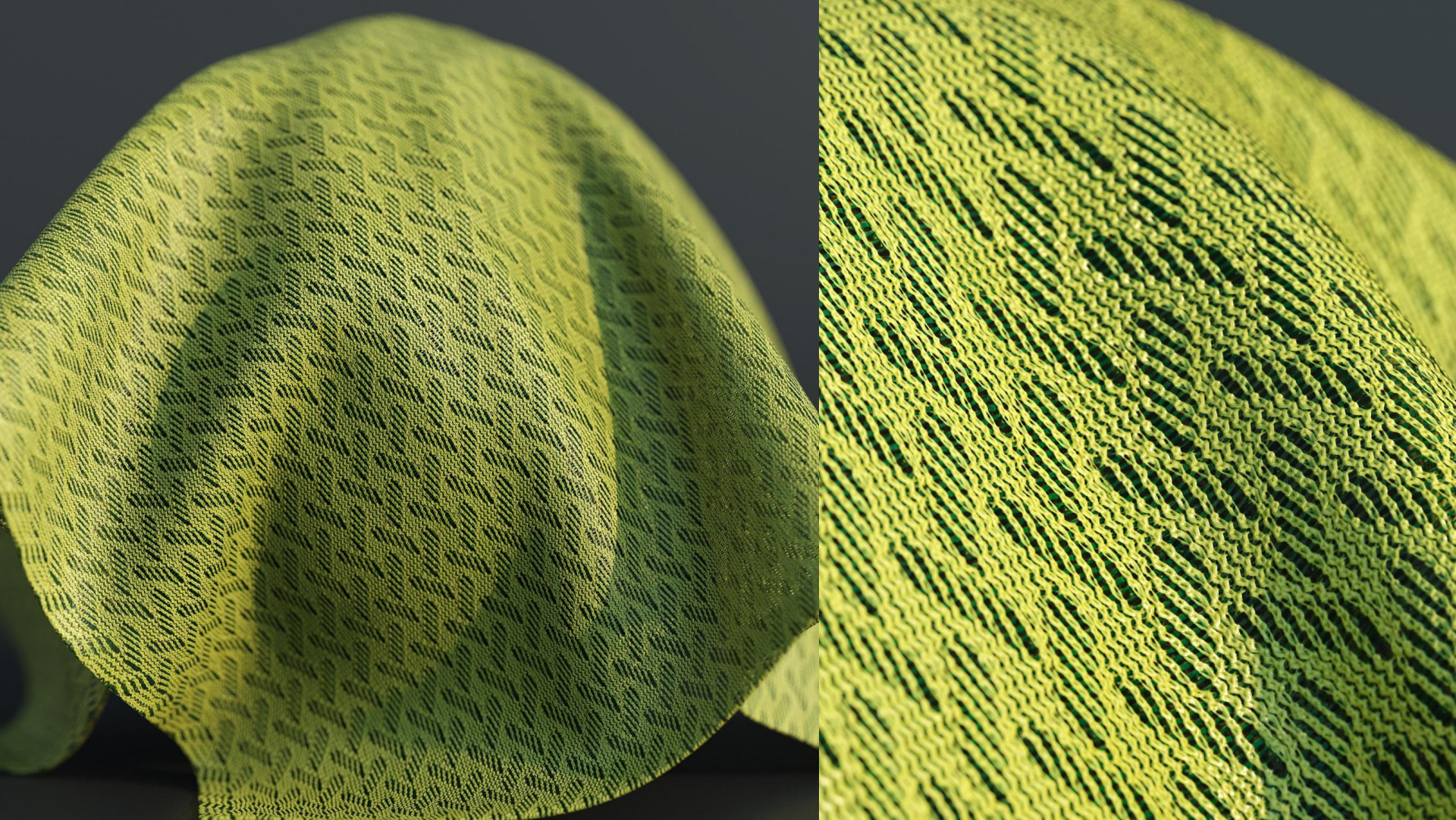
ARTISTRY

ARTIFICIAL INTELLIGENCE

Art by Josip Vrandecic


90
270
225
315
135
45





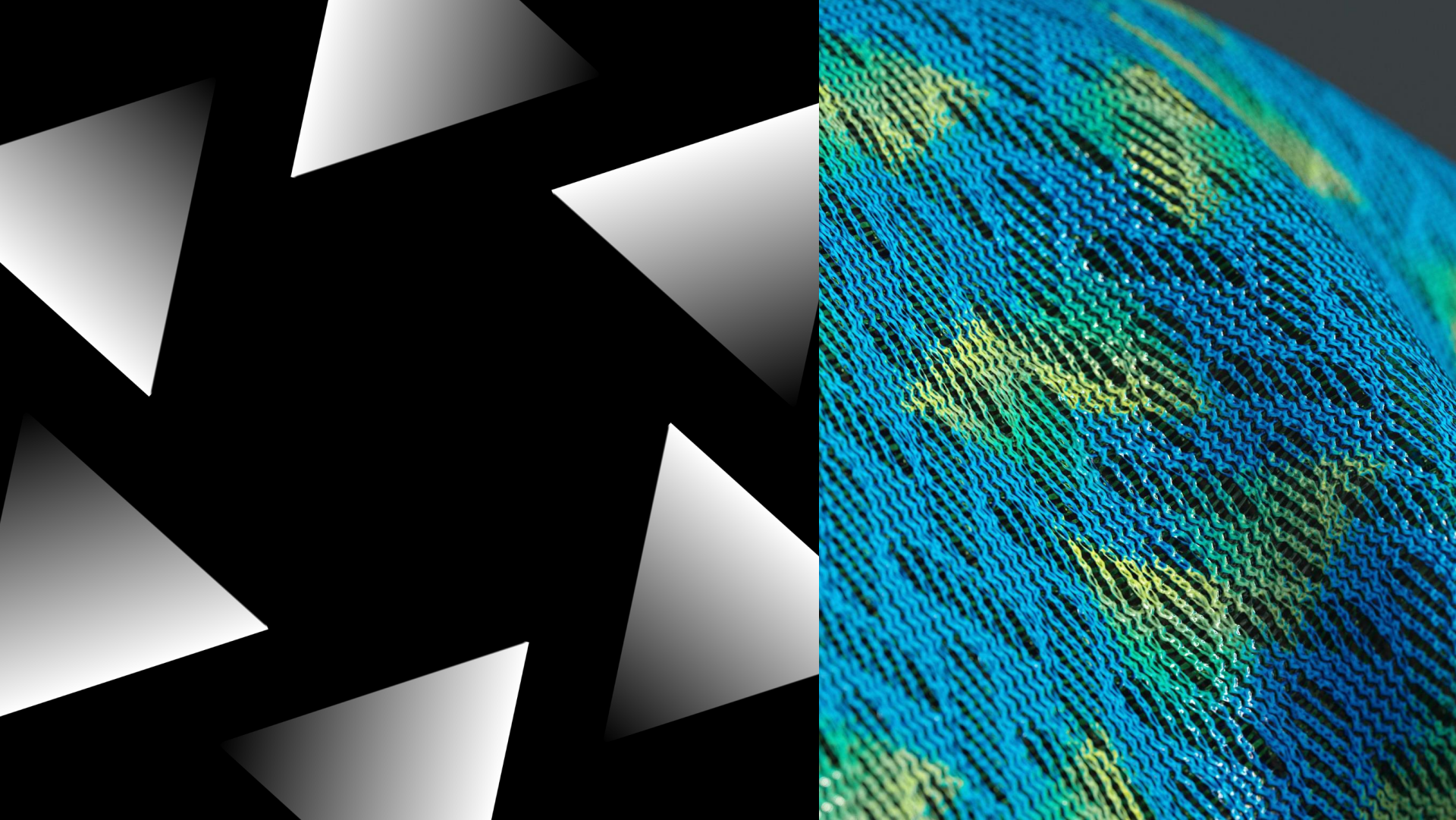
PROCEDURAL

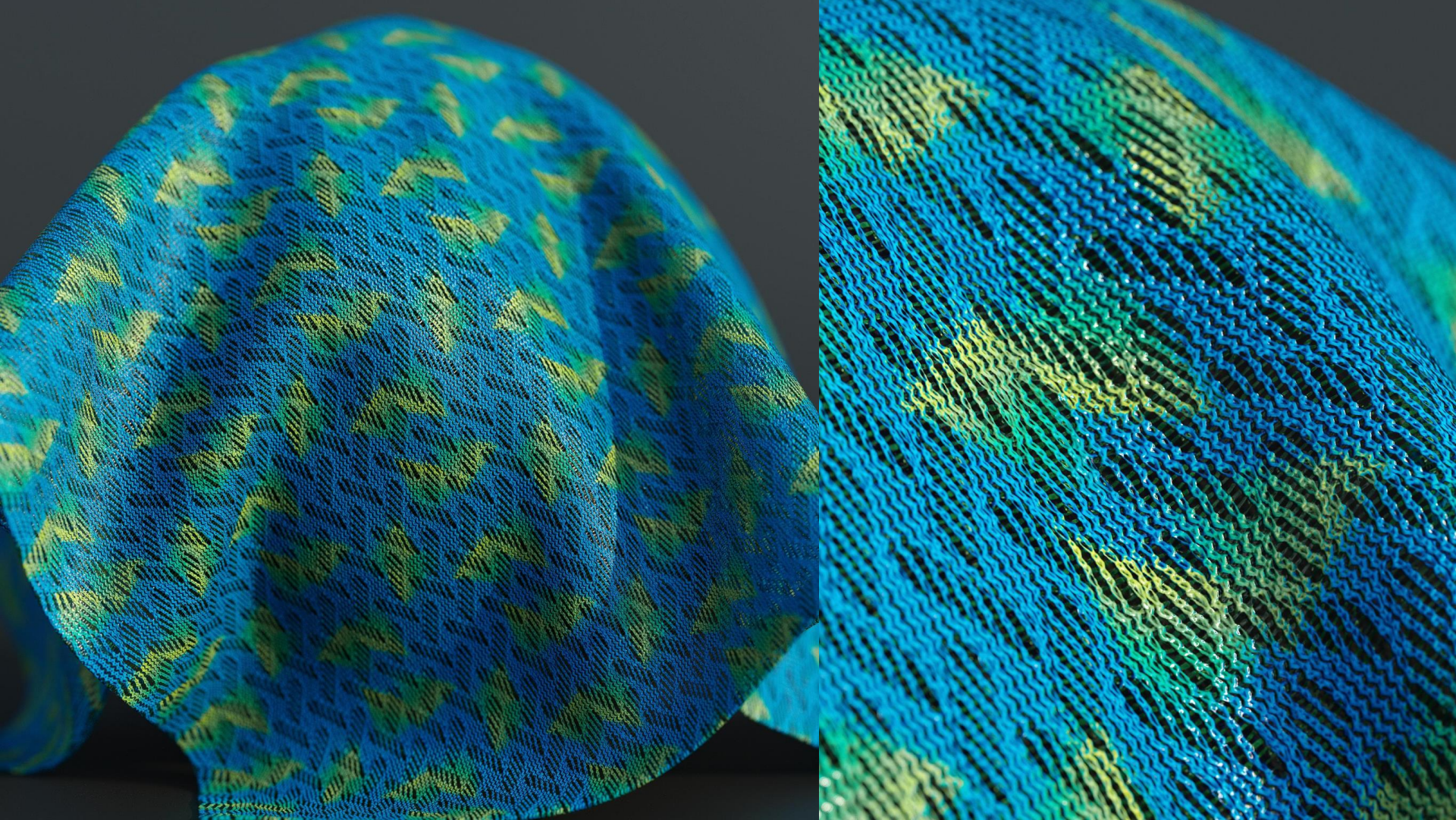
CAPTURE

ARTISTRY

ARTIFICIAL INTELLIGENCE

Art by Josip Vrandecic





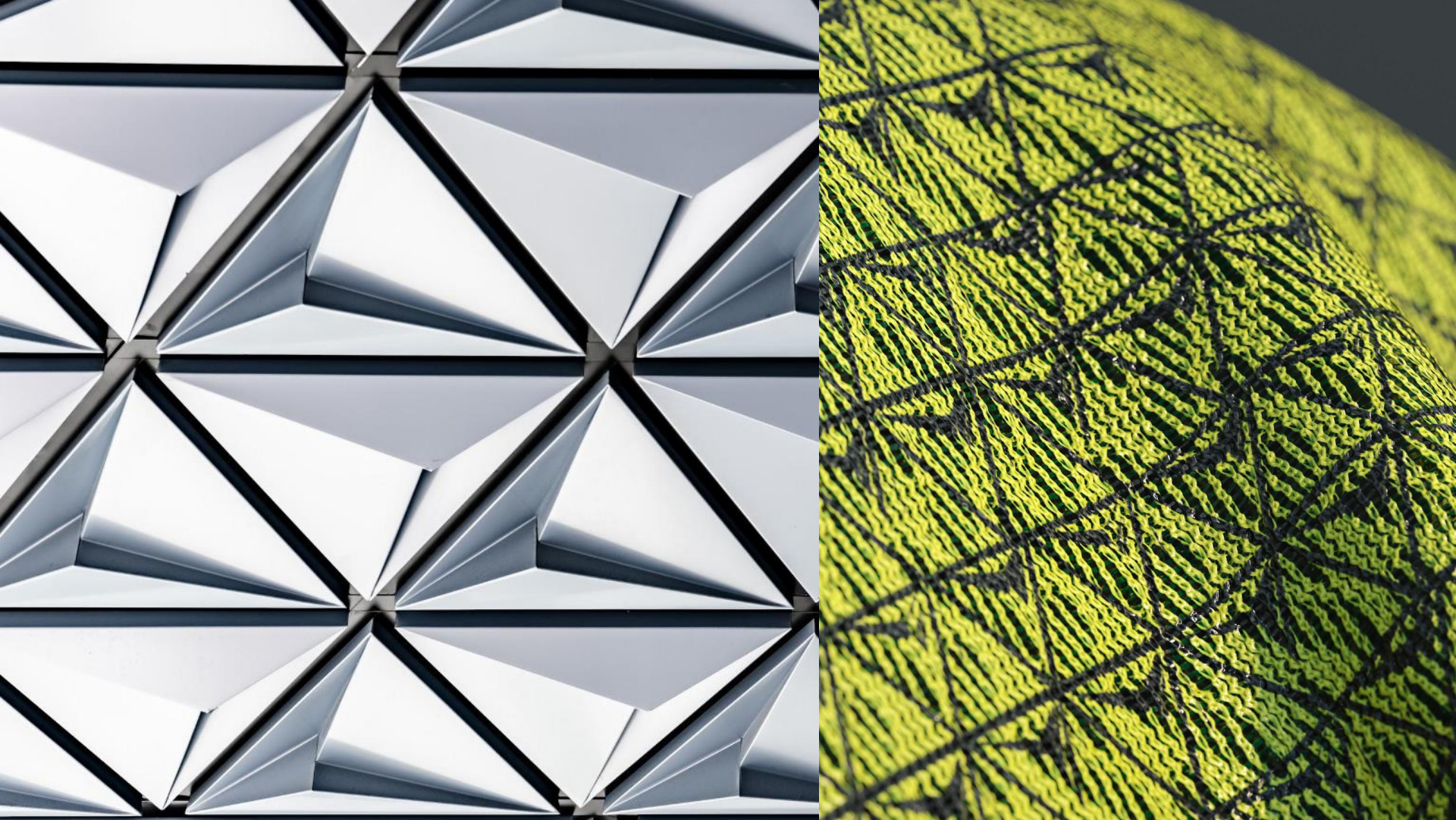
PROCEDURAL

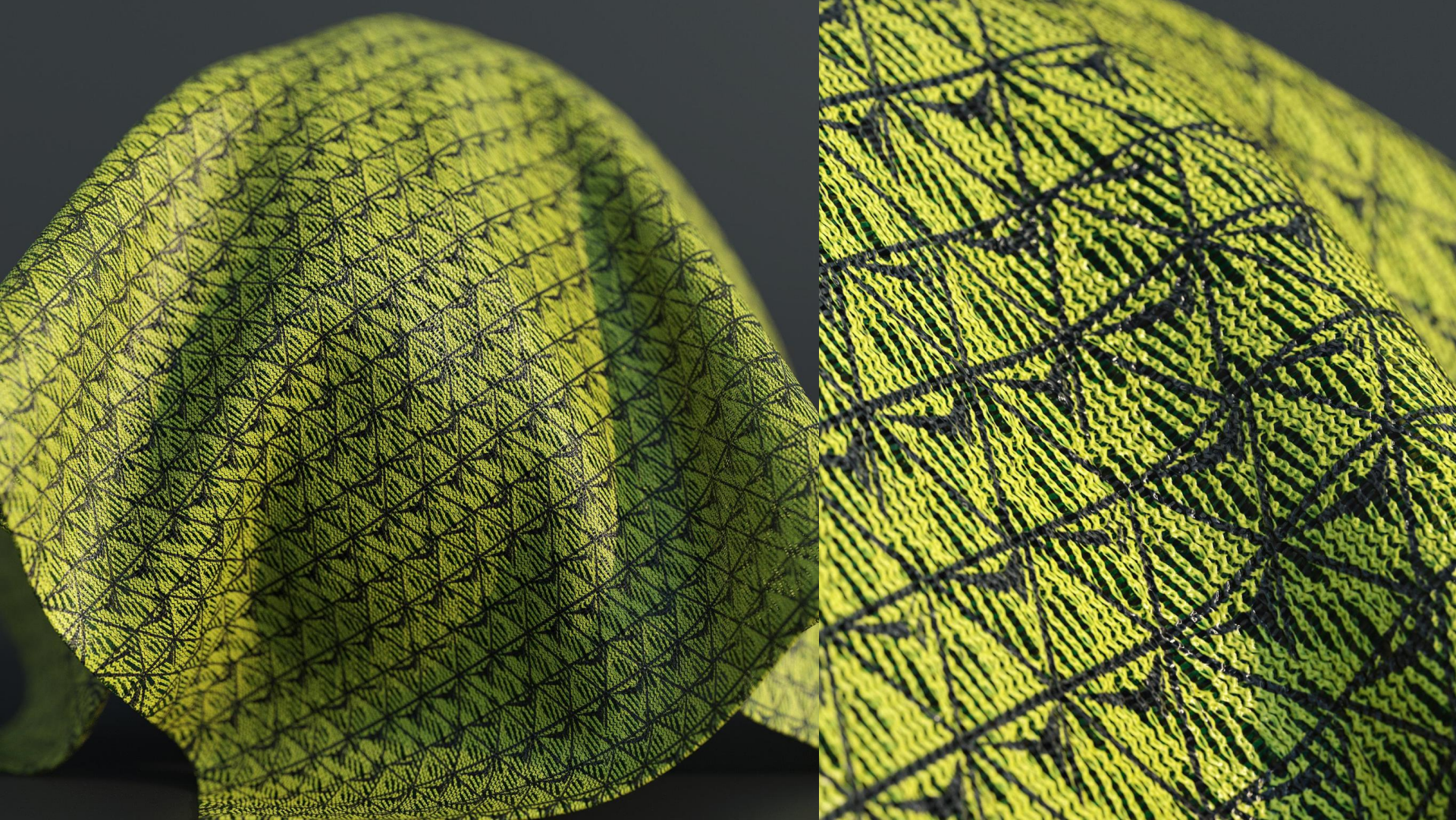
CAPTURE

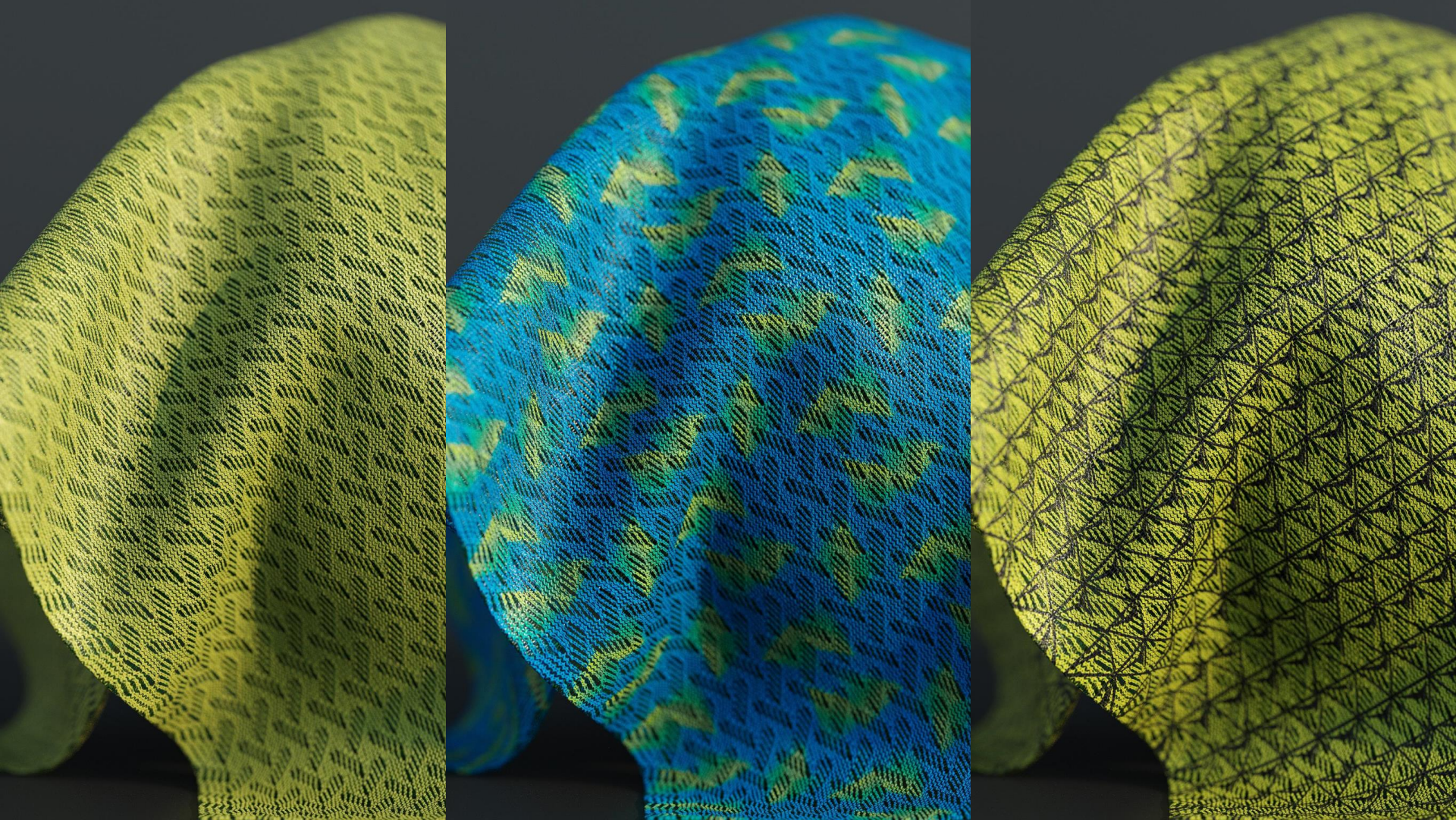
ARTISTRY

ARTIFICIAL INTELLIGENCE

Art by Josip Vrandecic







PROCEDURAL

CAPTURE

ARTISTRY

ARTIFICIAL INTELLIGENCE

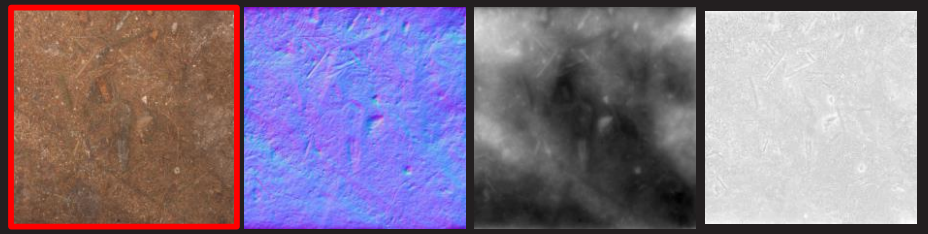
Art by Josip Vrandecic

DELIGHTING AN IMAGE WITH DEEP LEARNING

CONTEXT

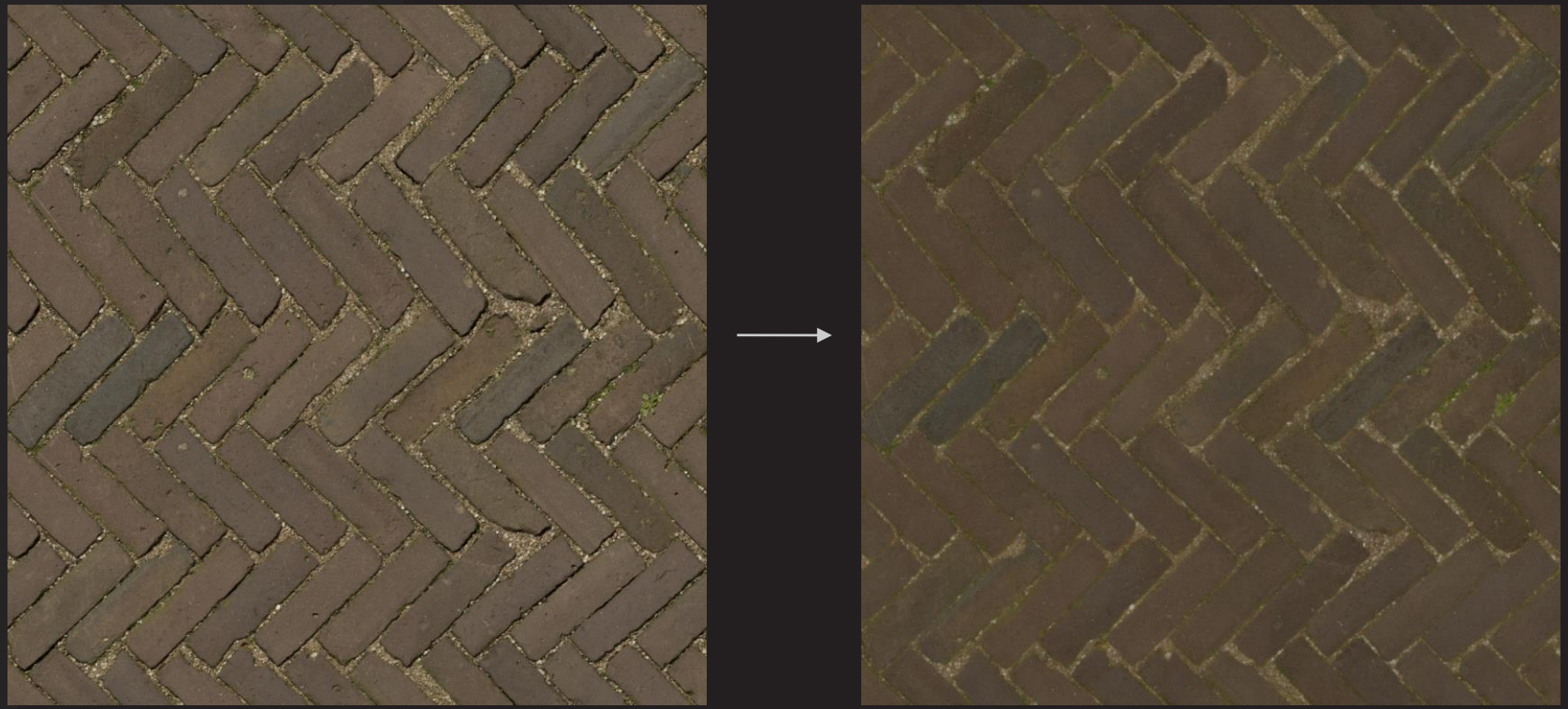
Create a Material from a Single Image

4K Picture



4K Material

Delighting: From picture to basecolor



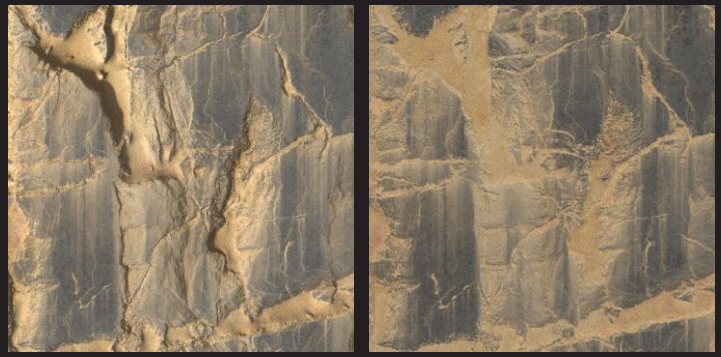
Why delighting ?

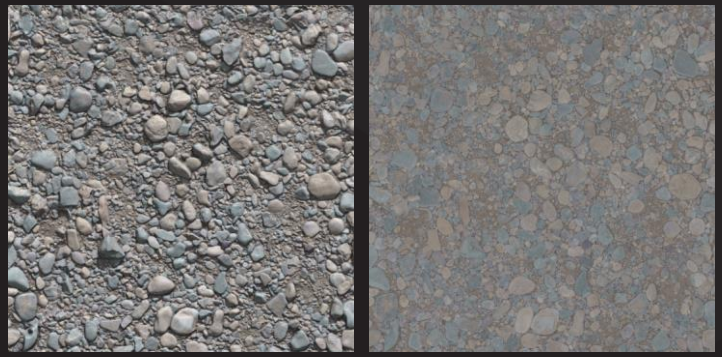
Scan as basecolor

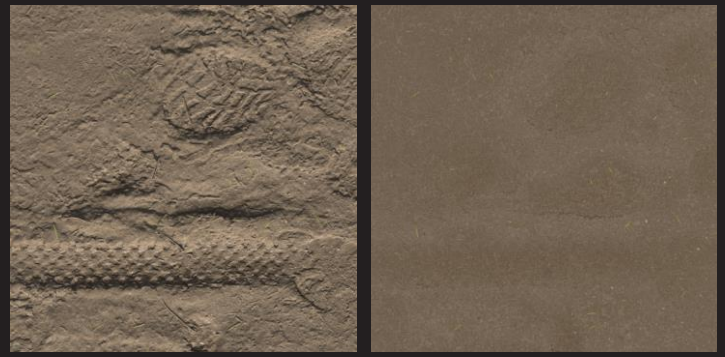
Correct basecolor

DATASET GENERATION

How To Obtain Training Pairs?



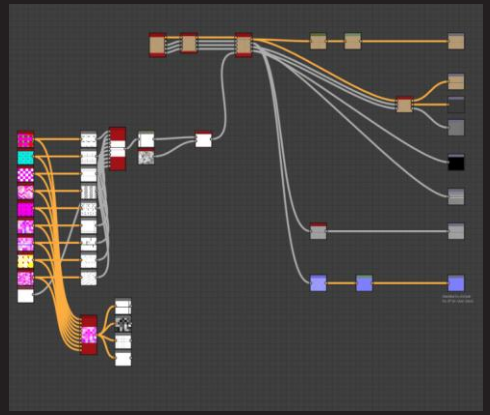


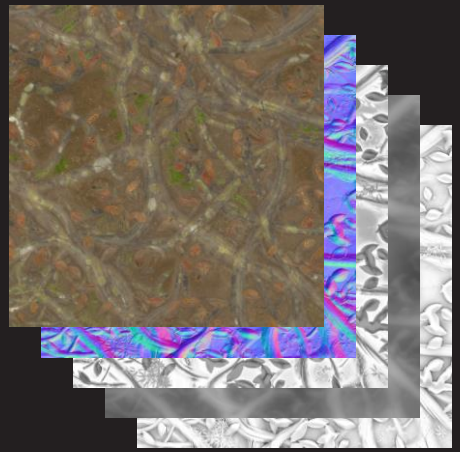


Dataset Generation Overview

SUBSTANCE SOURCE

SUBSTANCE AUTOMATION TOOLKIT



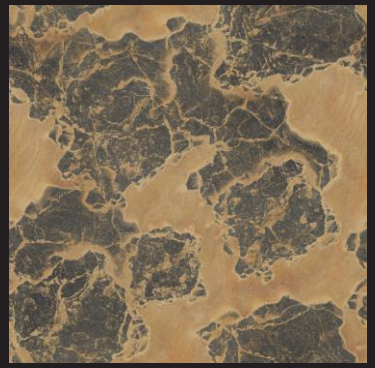


SUBSTANCE FILE

MATERIALS

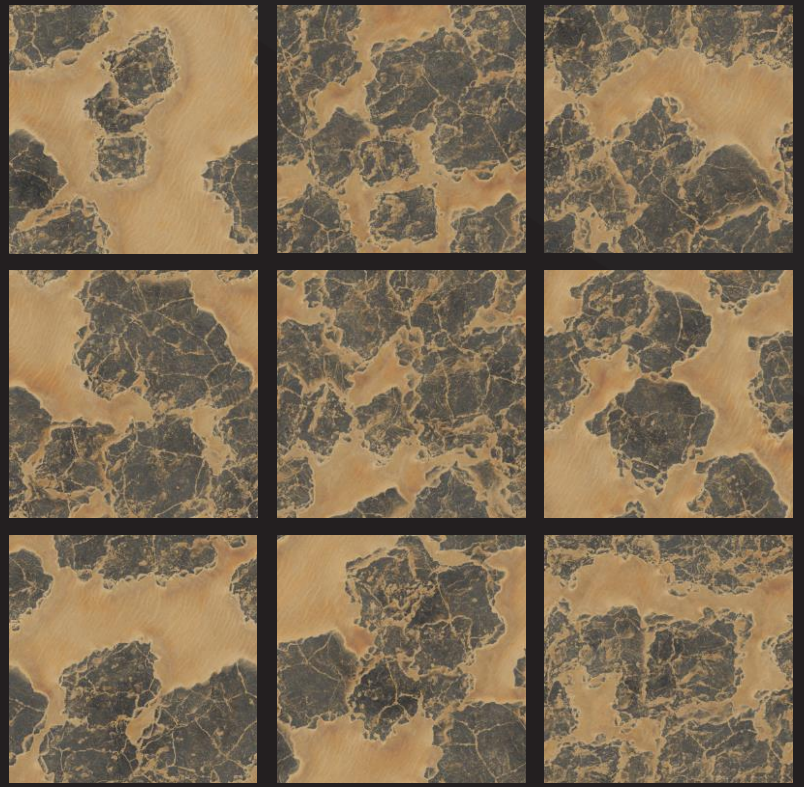
RENDERS

Substance File to Materials: Random Seed Variation

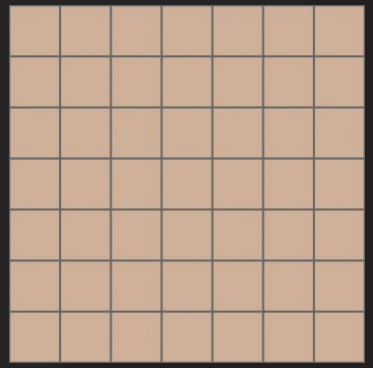


Albedo

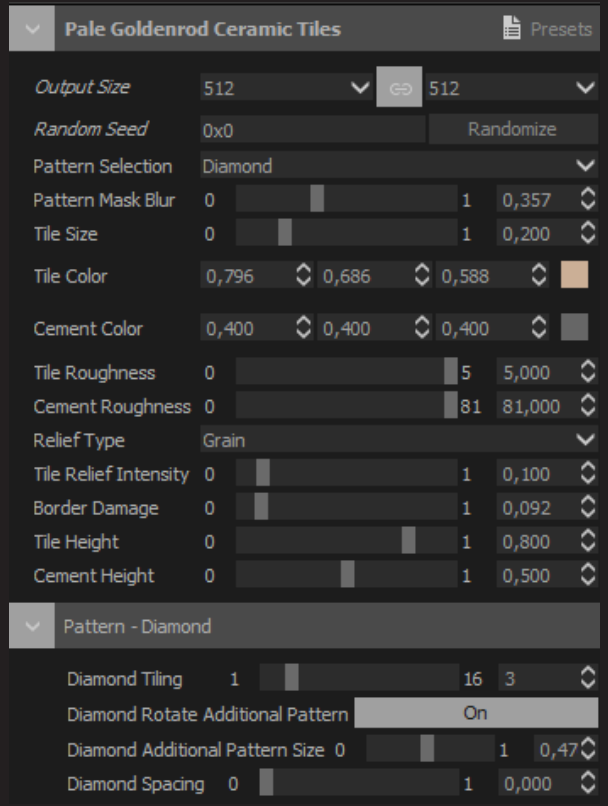
SUBSTANCE
AUTOMATION TOOLKIT



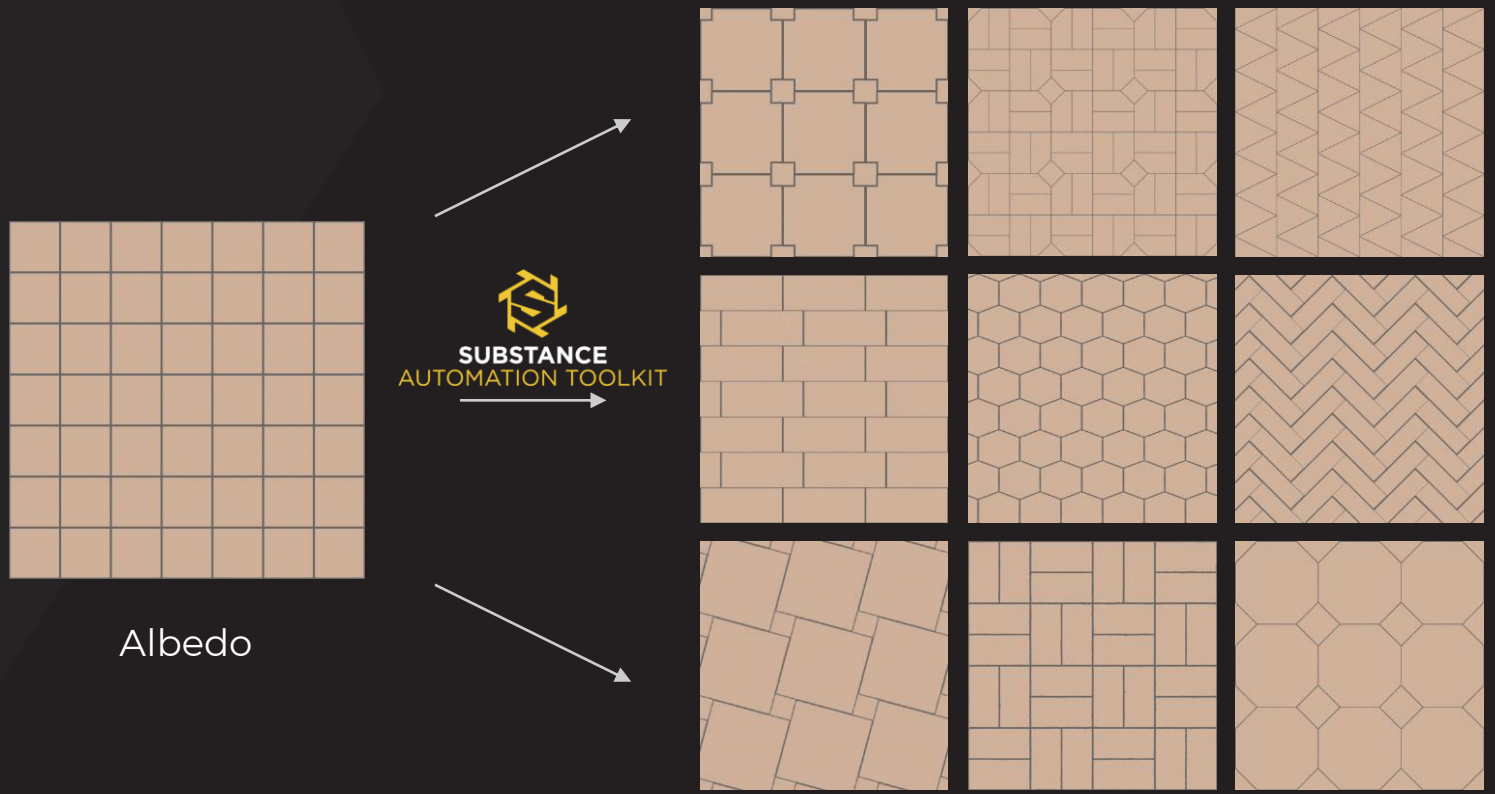
Substance File to Materials: Parameters Variation



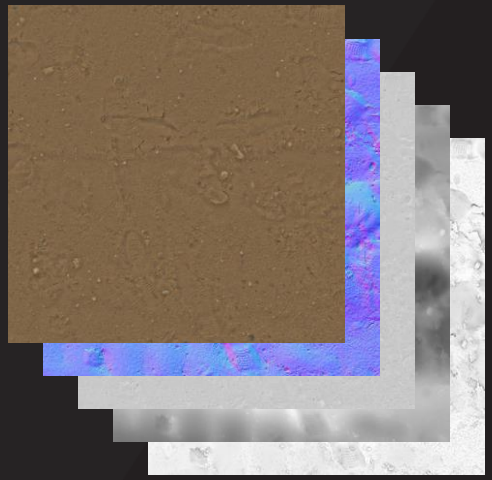
Albedo



Substance File to Materials: Parameters Variation

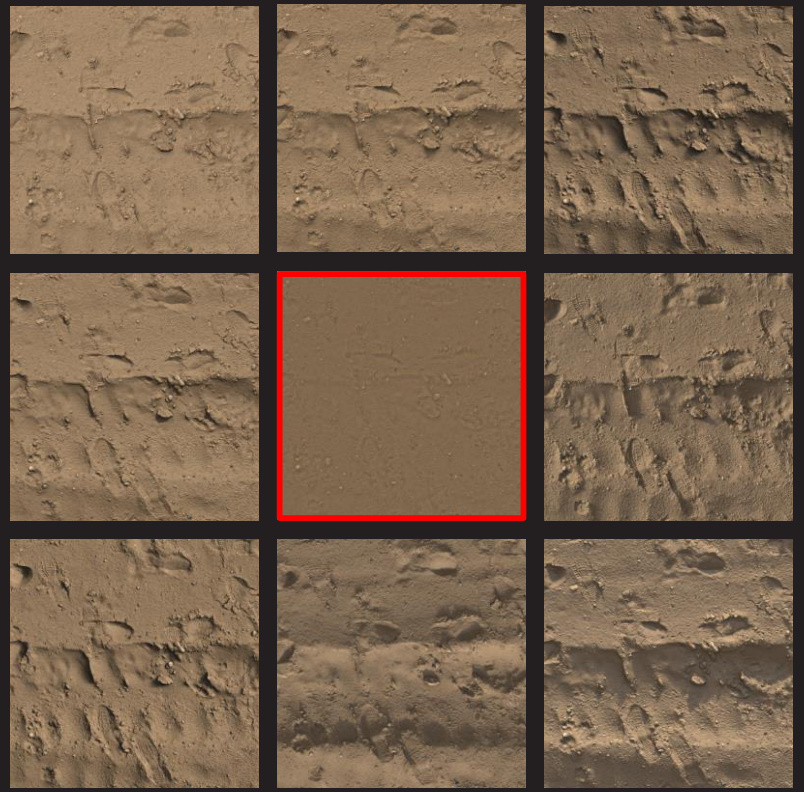


Material to Renders: Lighting Conditions

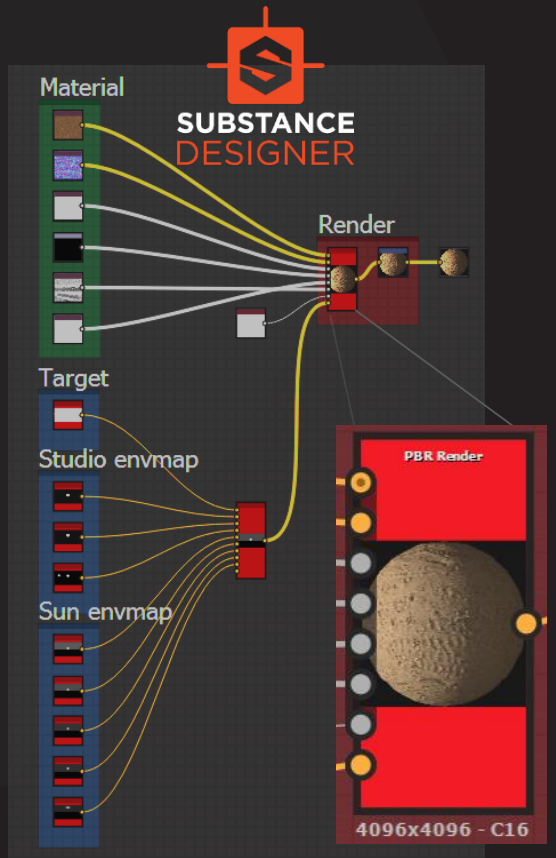


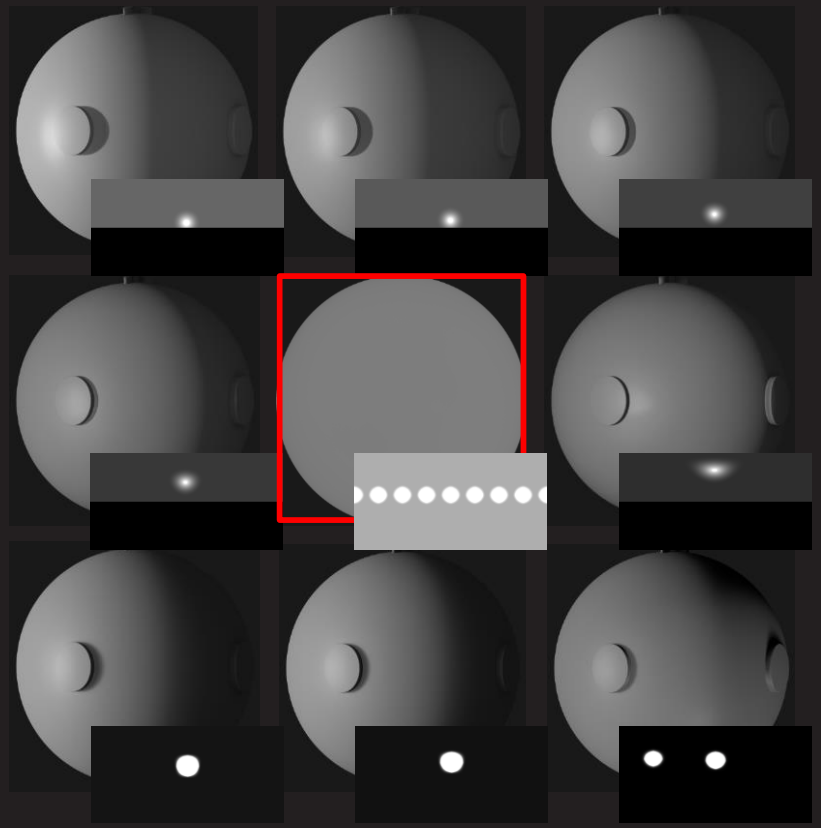
PBR material

SUBSTANCE
AUTOMATION TOOLKIT



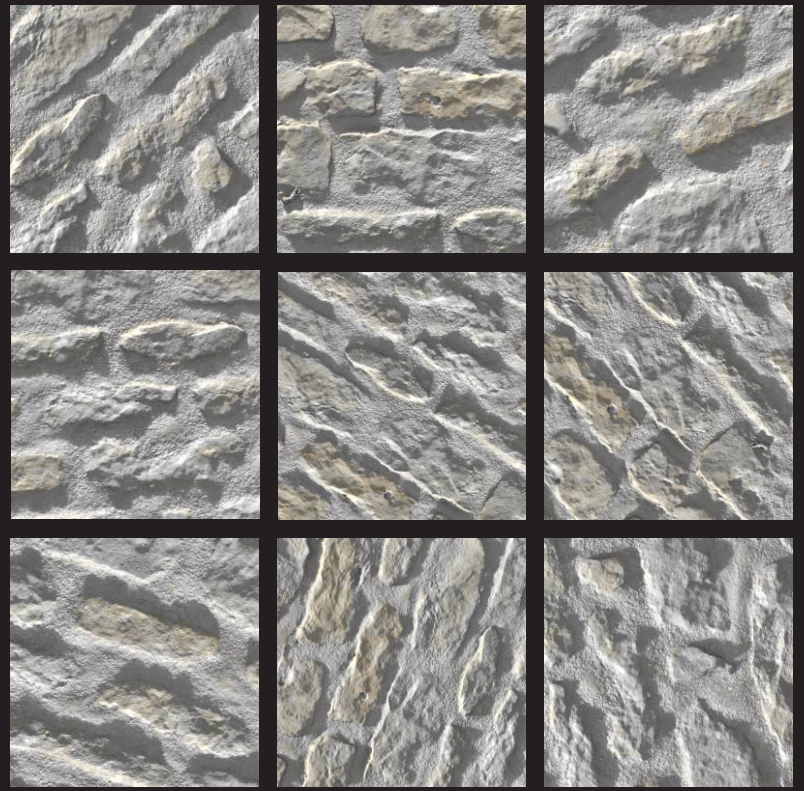
Material to Renders: Lighting Conditions





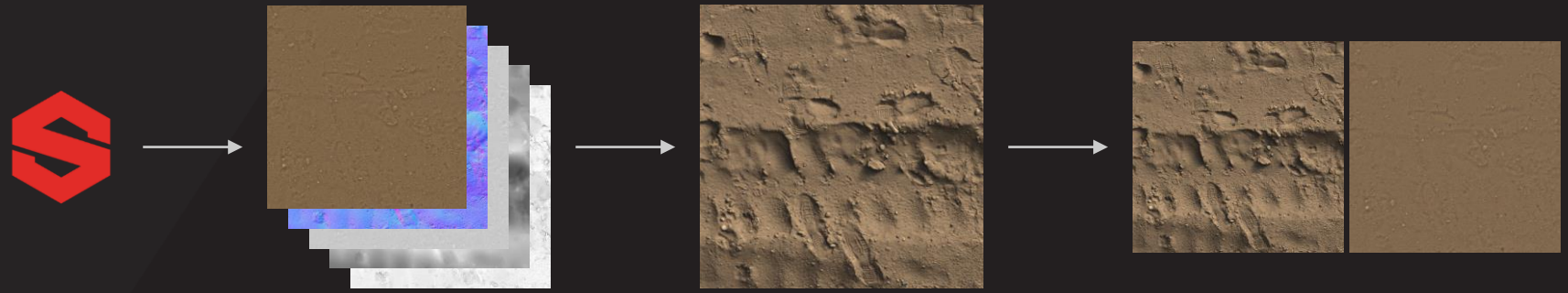
Patches Extraction

2048 x 2048



512 x 512 crops

Data generation summary



~300
Substance files

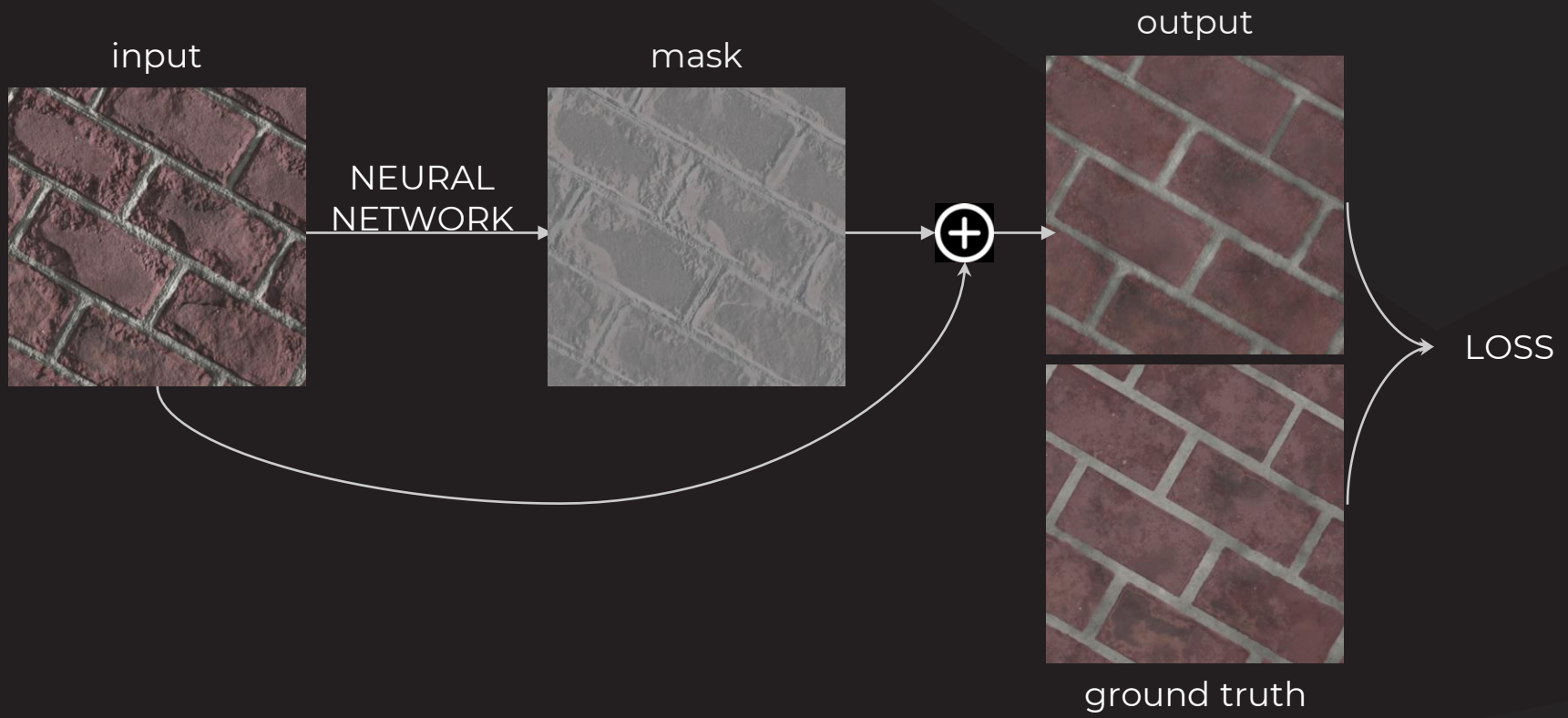
~1800
materials

~25000
renders

~380000
training pairs

NETWORK ARCHITECTURE

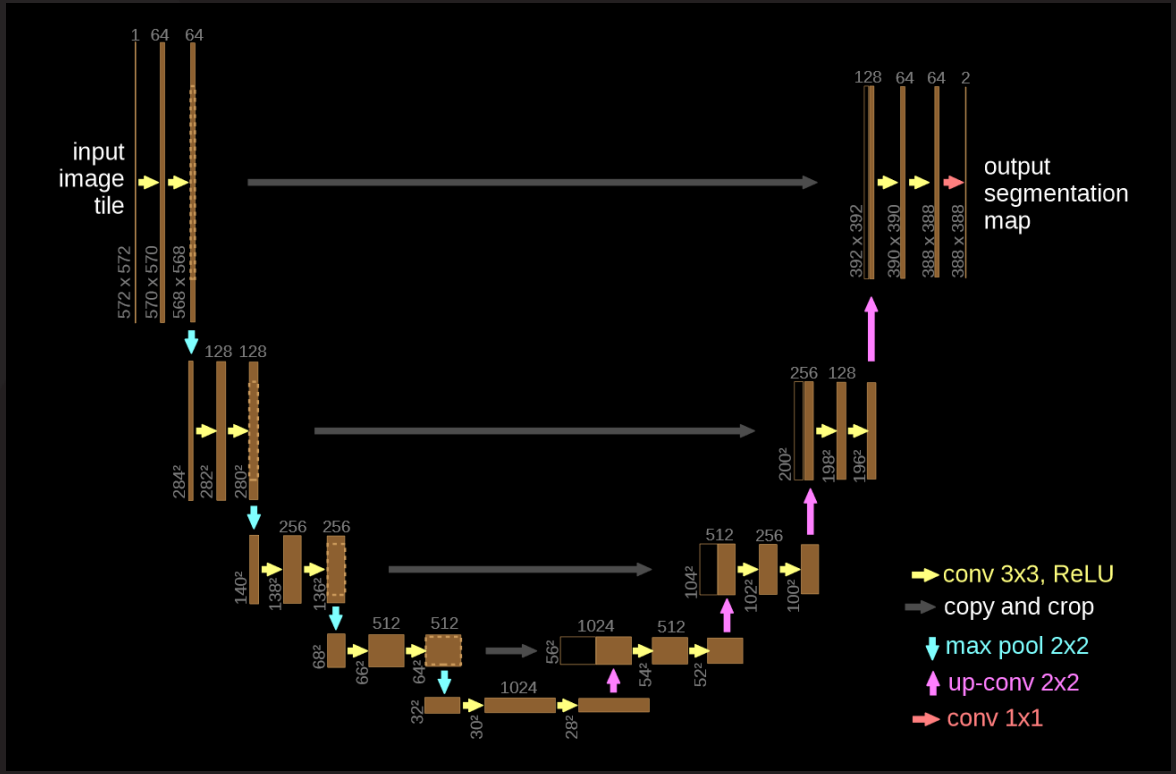
Model Overview



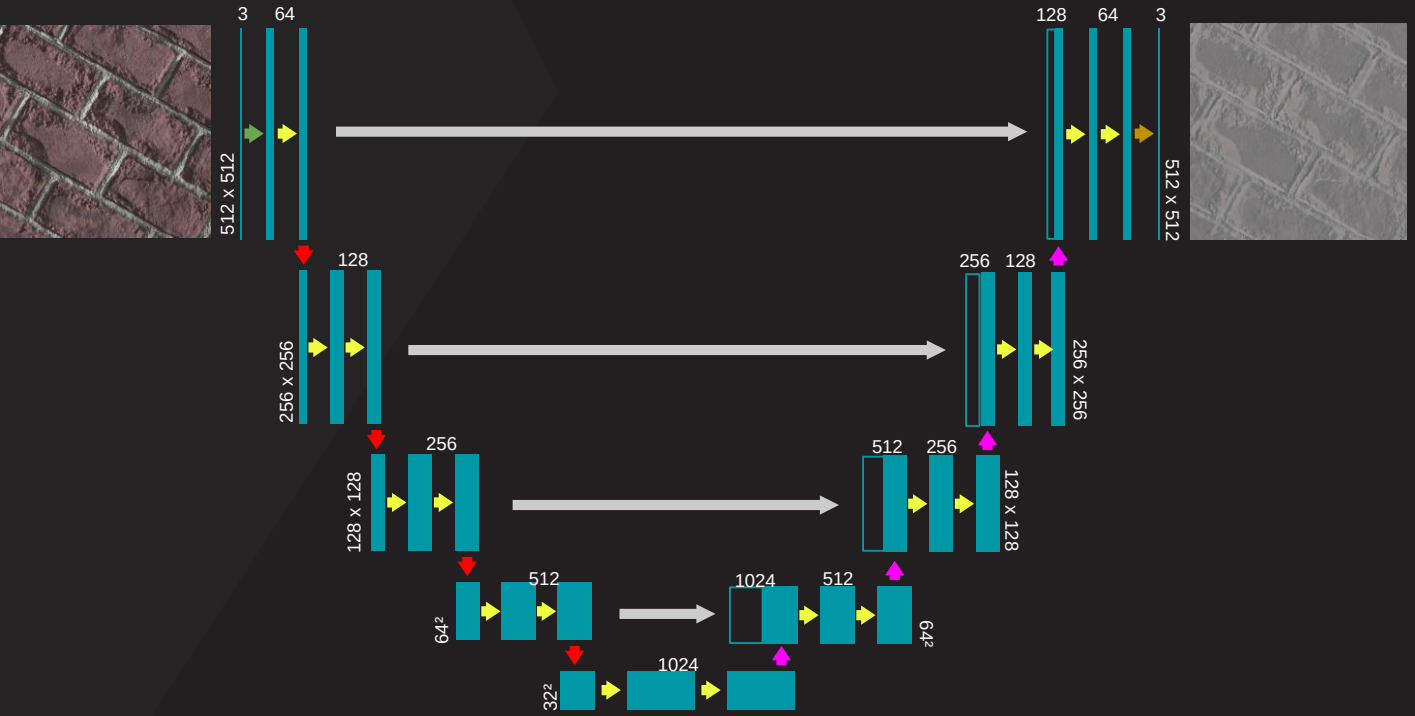
U-Net: Convolutional Networks for Biomedical Image Segmentation

O. Ronneberger, P. Fischer and T. Brox

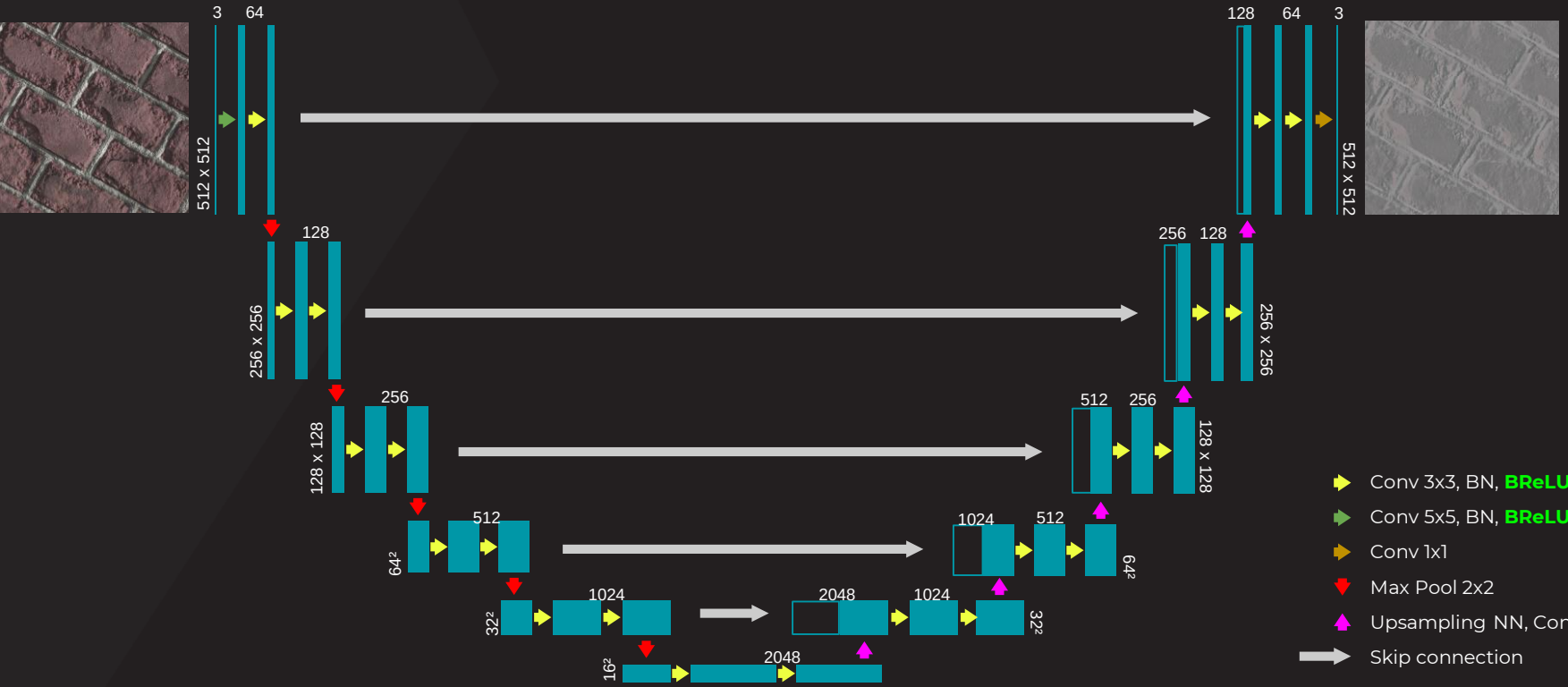
In MIC-CAI, pages 234-241. Springer 2015



Delighter architecture



Delighter architecture



Delighter architecture - Receptive field

Poisson Reconstruction for High Resolution Inputs

Input 4x4 crops

Before / After Poisson solving

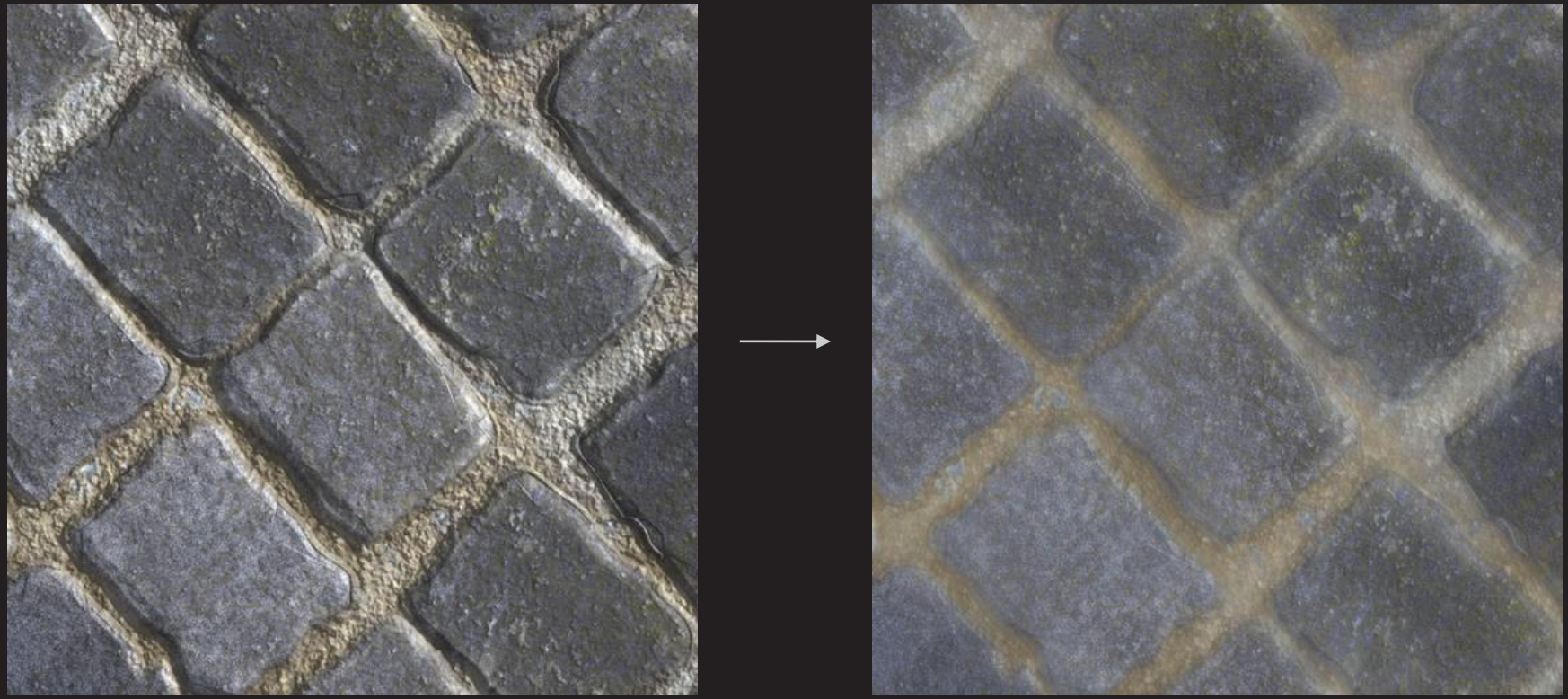
Influence of Padding

0-Padding

Mirrored

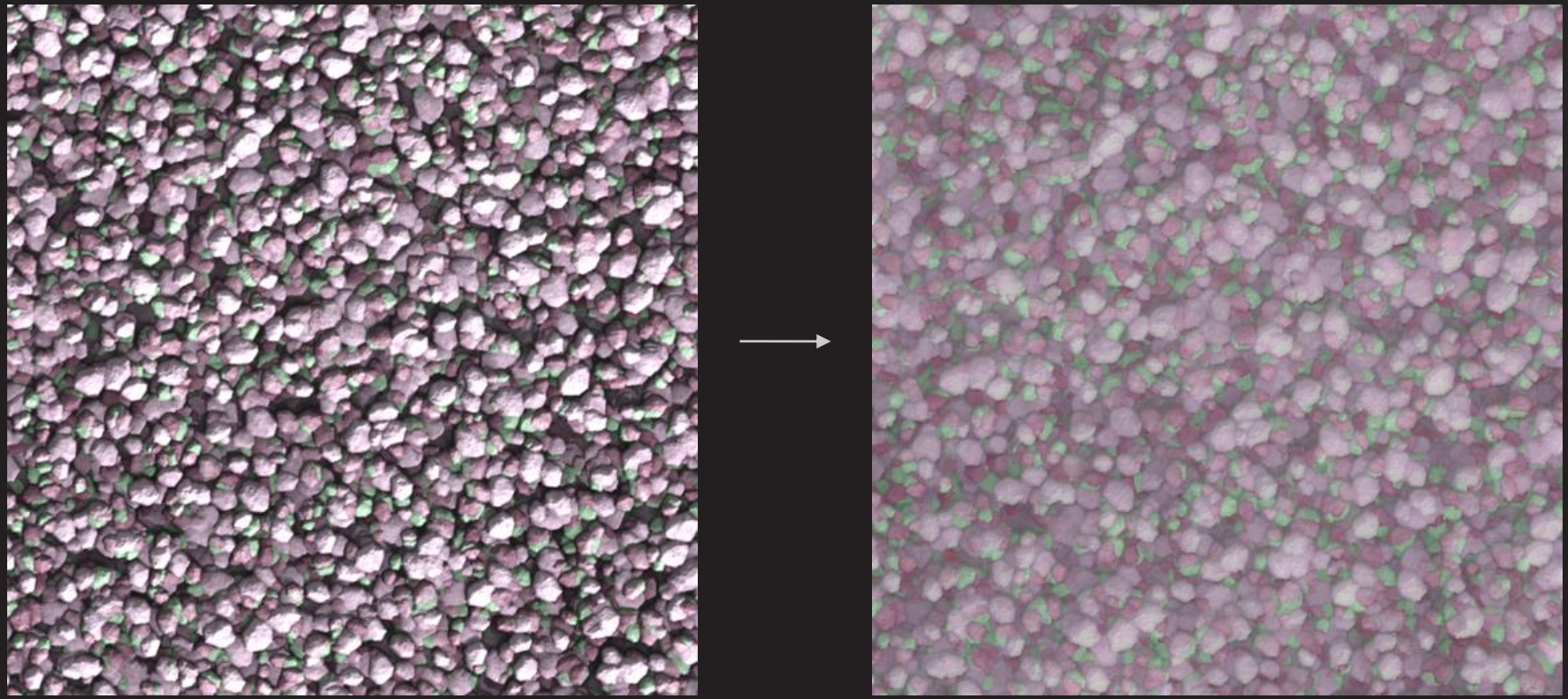
RESULTS

Qualitative Results - On test set

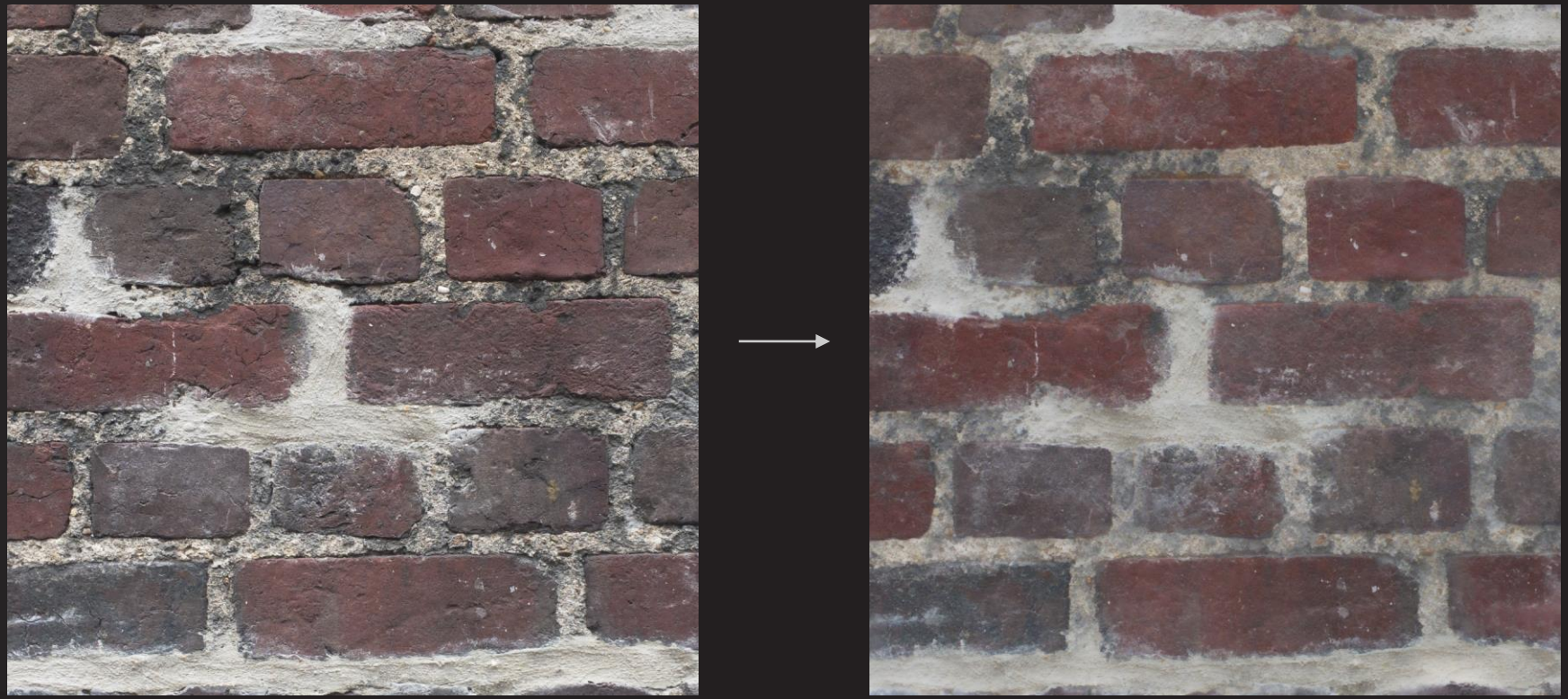


Qualitative Results - On test set

Qualitative Results - On test set

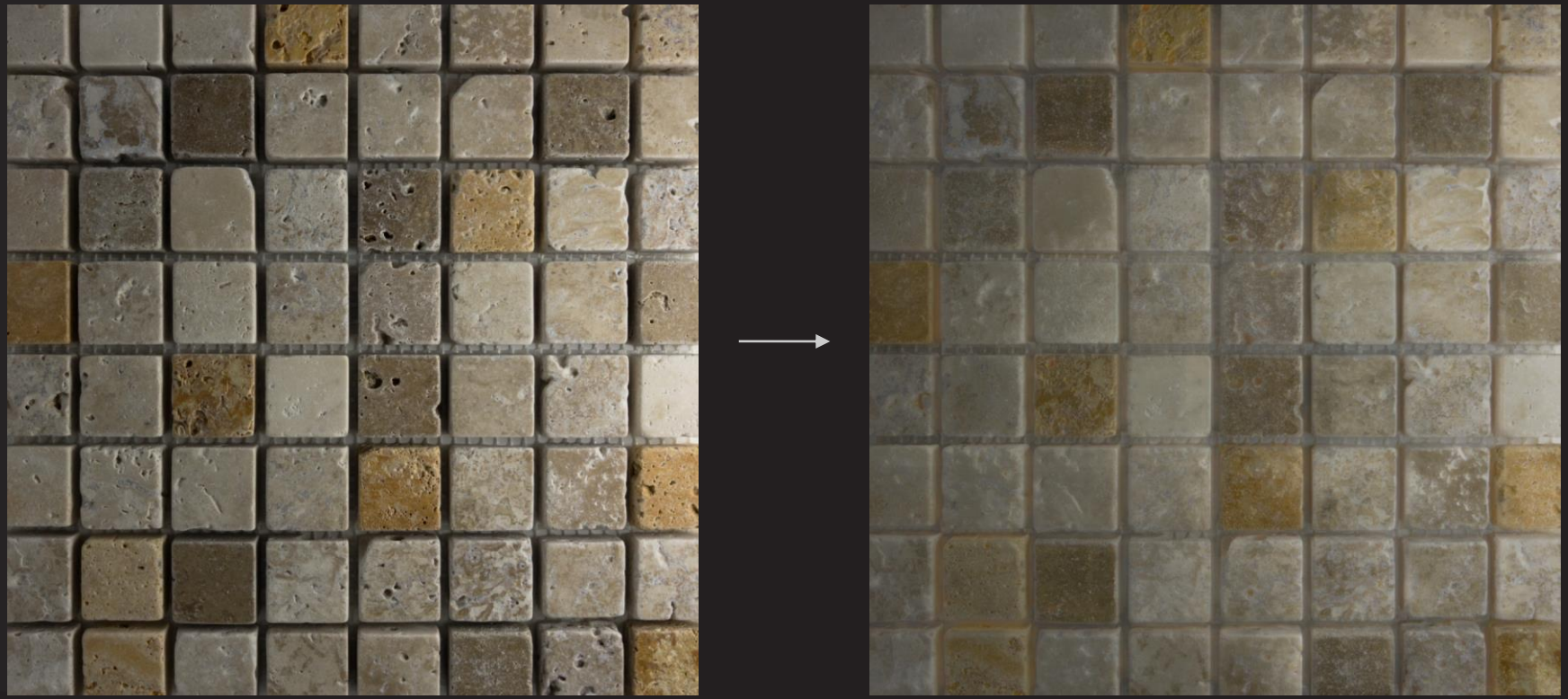


Qualitative Results - On pictures



Qualitative Results - On pictures

Qualitative Results - On pictures



Qualitative Results - On pictures

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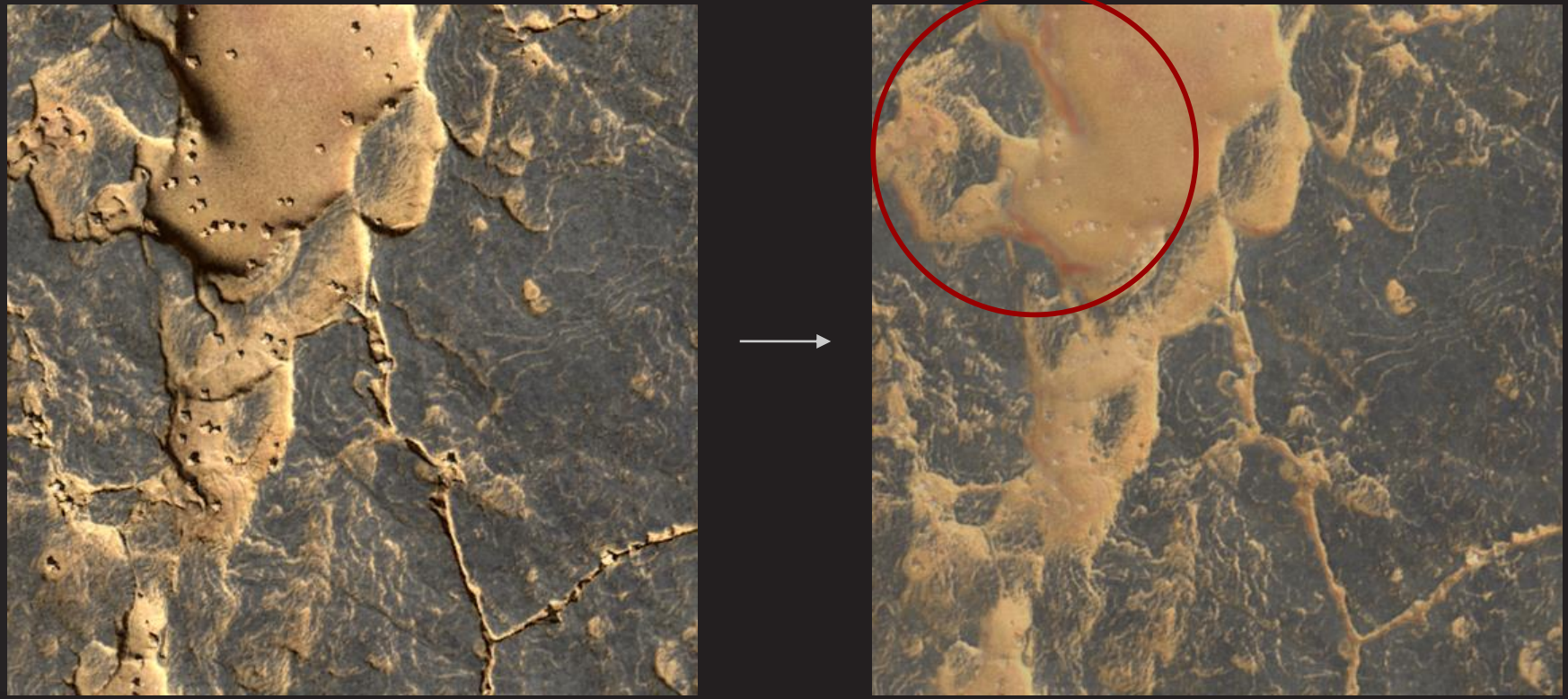
Qualitative Results - On pictures

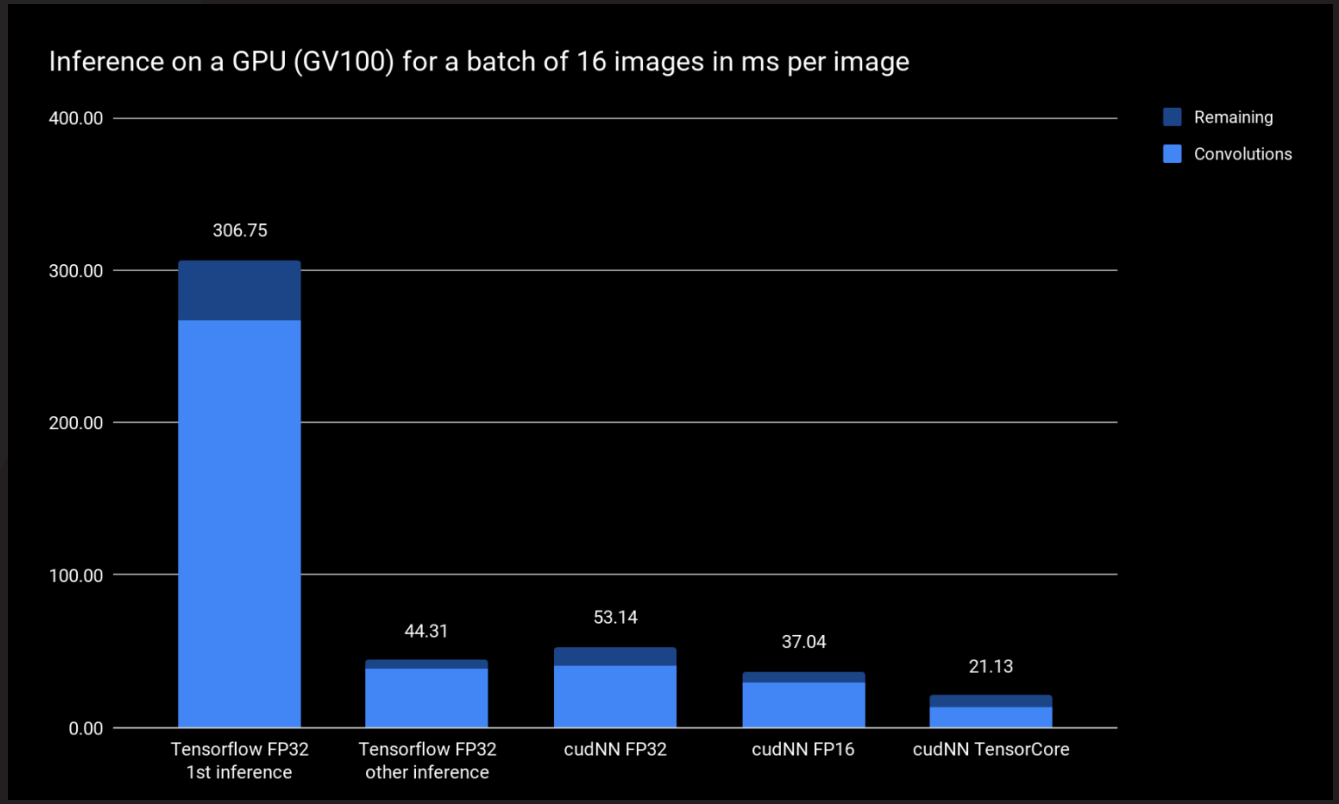
Qualitative Results - On pictures

Example of Failure Case



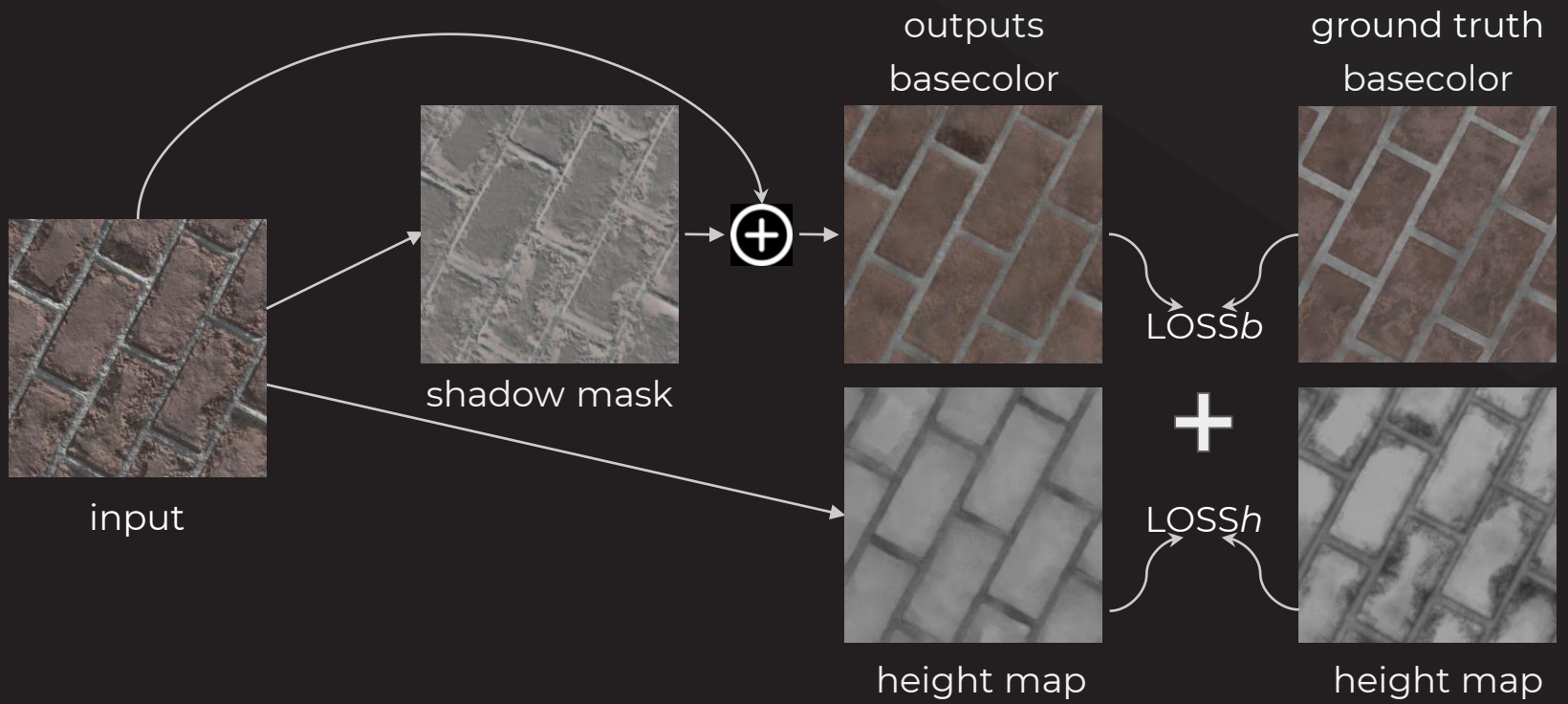
Example of Failure Case

Speed Benchmark

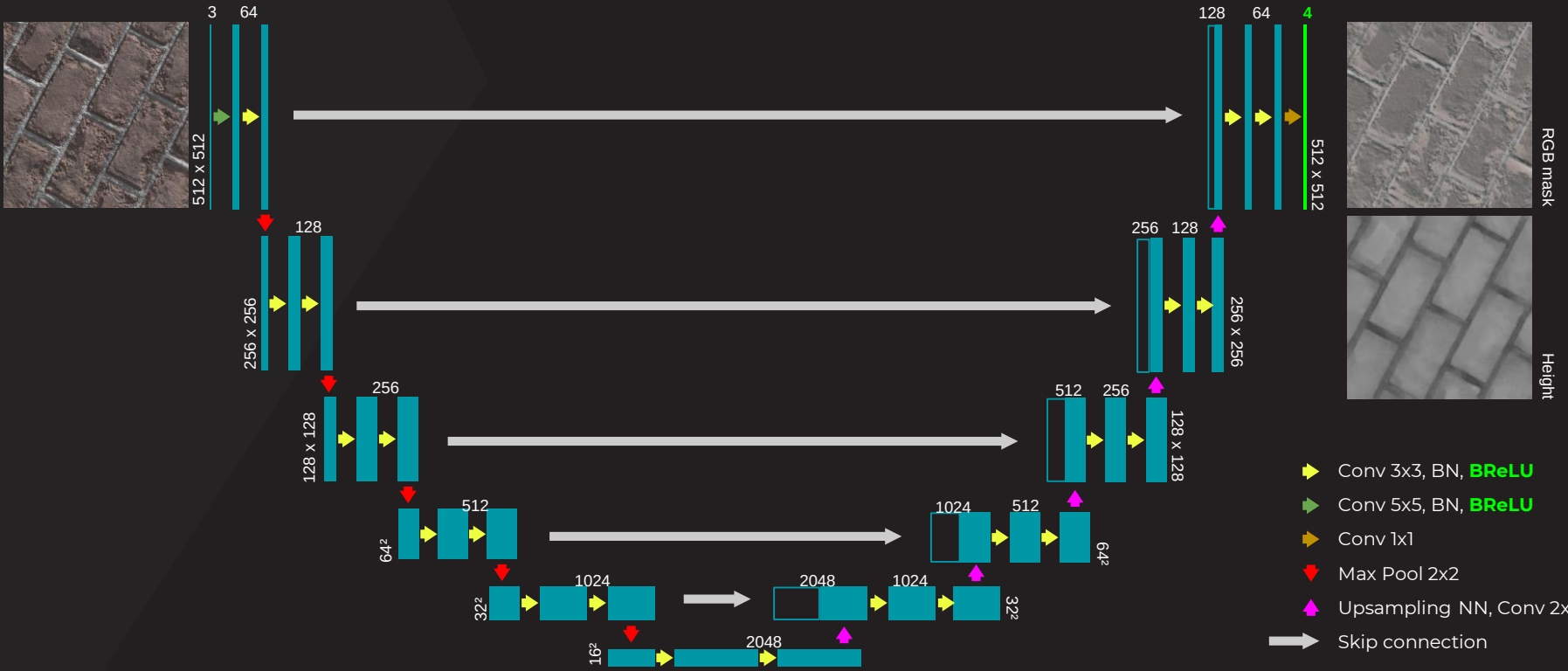


PERSPECTIVES

Model Overview



Model architecture



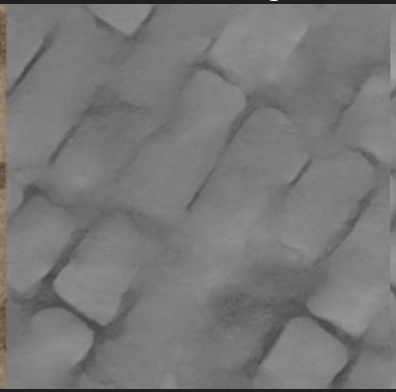
Early results

Input

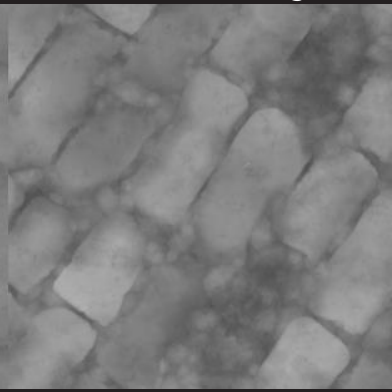
Extracted basecolor

Ground truth basecolor

Extracted Height



Ground truth Height



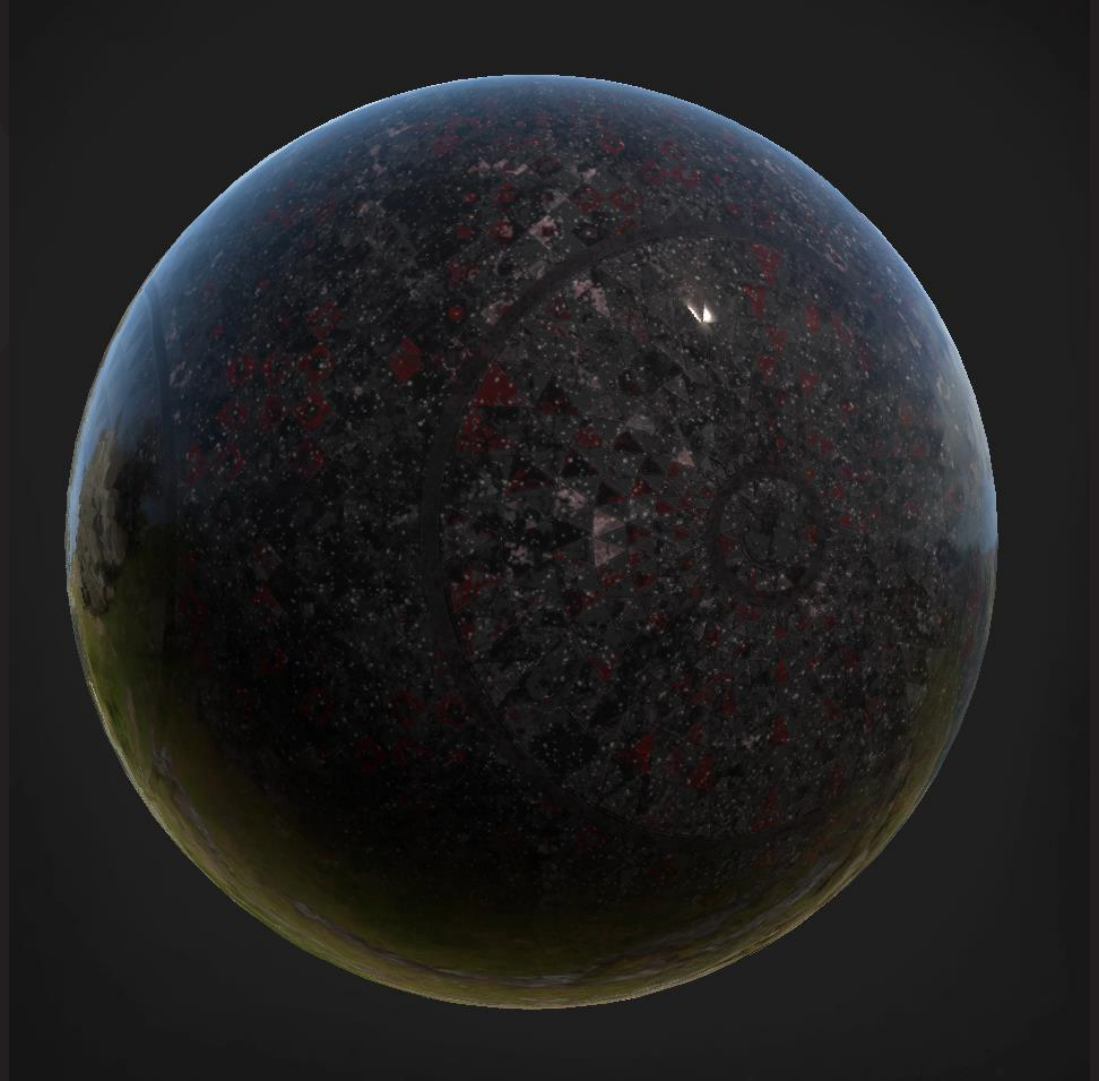
DEMO TIME

Art by Nicolas Millot & Geoffrey Rosin

Art by Nicolas Millot & Geoffrey Rosin

Art by Nicolas Millot

Art by Nikola Damjanov



Art by Nikola Damjanov


Art by Reid Quisenberry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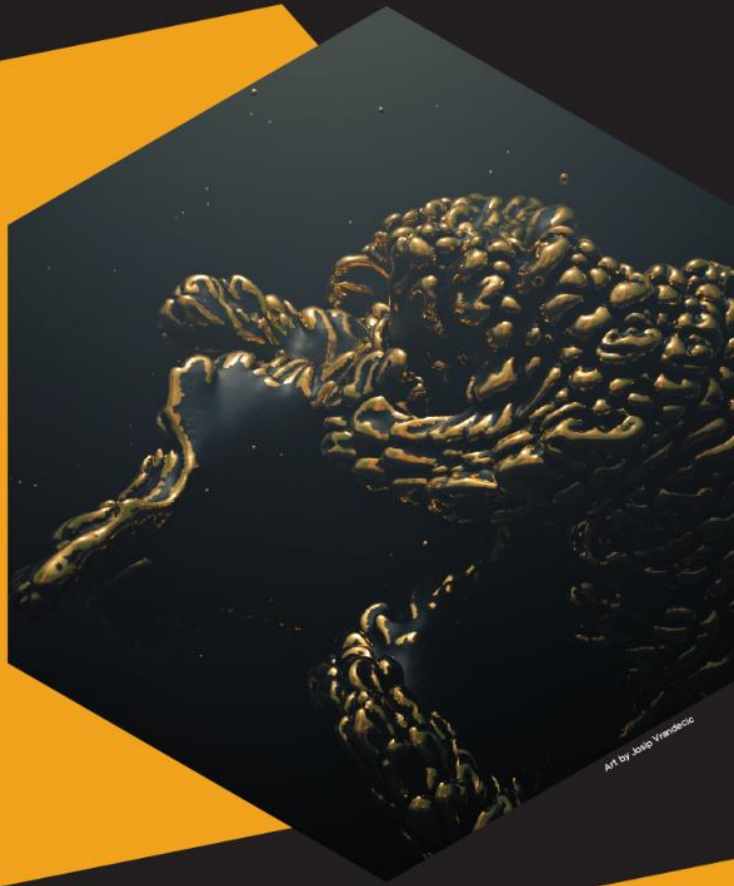

allegorithmic