AI-enabled imaging acquisition and enhancement

PET-CT application
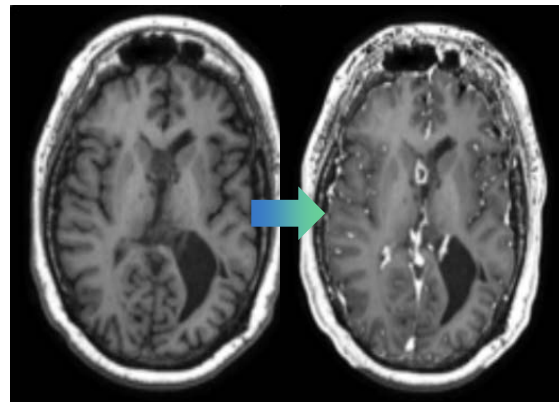
MRI application

Contrast dose application
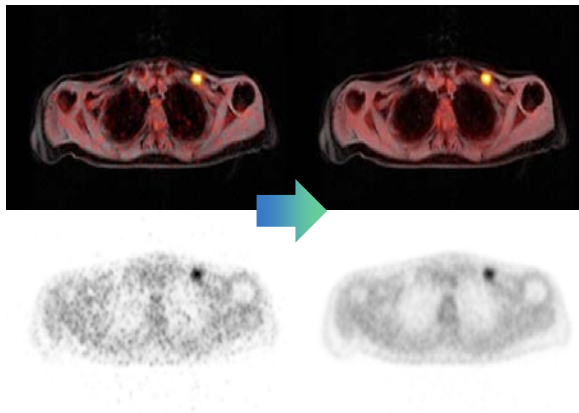
AI-powered better image quality and signal quality for PET
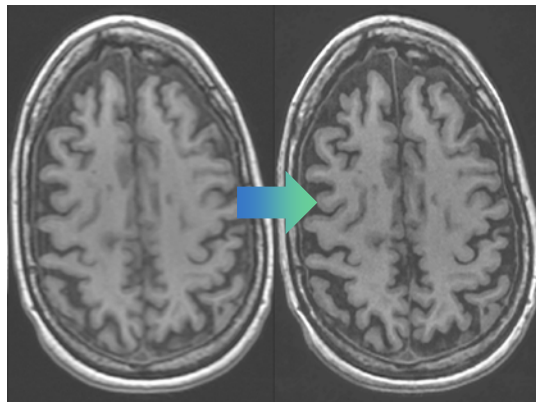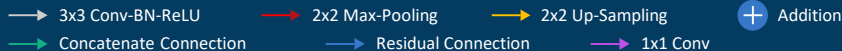
AI-powered better image quality, SNR and sharpness for MR

AI-powered contrast enhancement with 10% contrast dose

Enhao Gong, PhD, Stanford University

Founder&CEO, Subtle Medical Inc.

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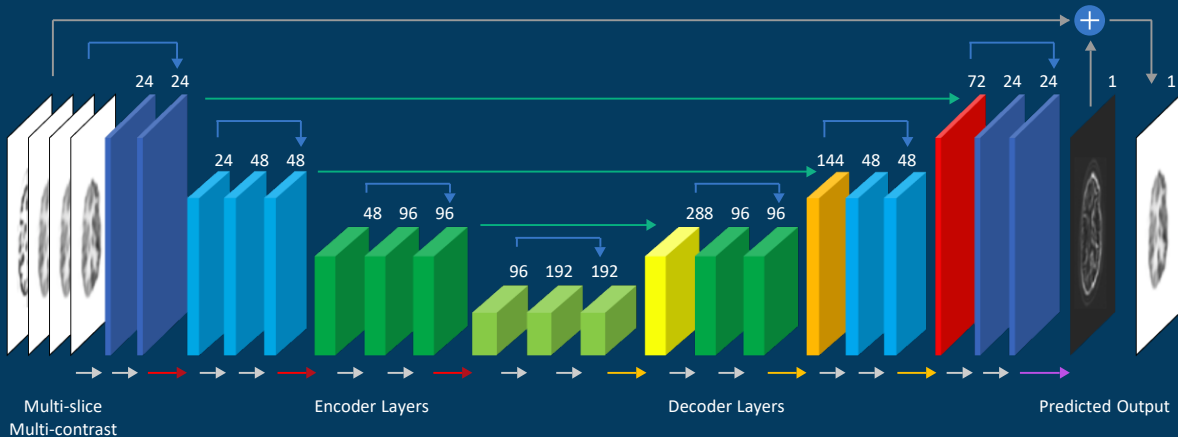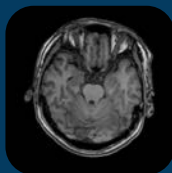
Deep Learning Pipeline
(simplified illustration)

Legend:
- → 3x3 Conv-BN-ReLU
- → 2x2 Max-Pooling
- → 2x2 Up-Sampling
- + Addition
- → Concatenate Connection
- → Residual Connection
- → 1x1 Conv

INPUTS

Images from scanner

- Lower quality
- Poorer resolution
- Lower-dose usage

Multi-slice Multi-contrast

Encoder Layers

Decoder Layers

Predicted Output

OUTPUTS

Images enhanced

- Superior quality at or beyond DOC
- Paired real clinical ground-truth acquired for training
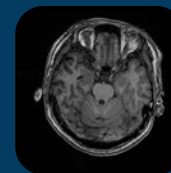
TECHNOLOGY:

AI technology trained and validated on unique paired datasets

**More data accumulated and performance evolves everyday**

- Special acquisition protocols under IRB
- Unique algorithms and implementation for better quality and efficiency
- Compatibility to ALL scanners and PACS

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AI enhances image quality, generalizes at different conditions, and achieves better quantification accuracy.

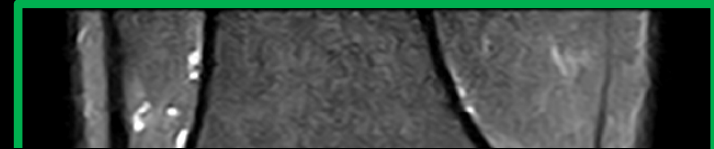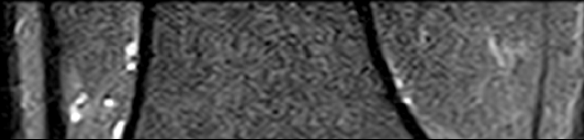Application: faster acquisition or low radiation dose for PET

AI Enhanced

SUV: AI vs ground-truth
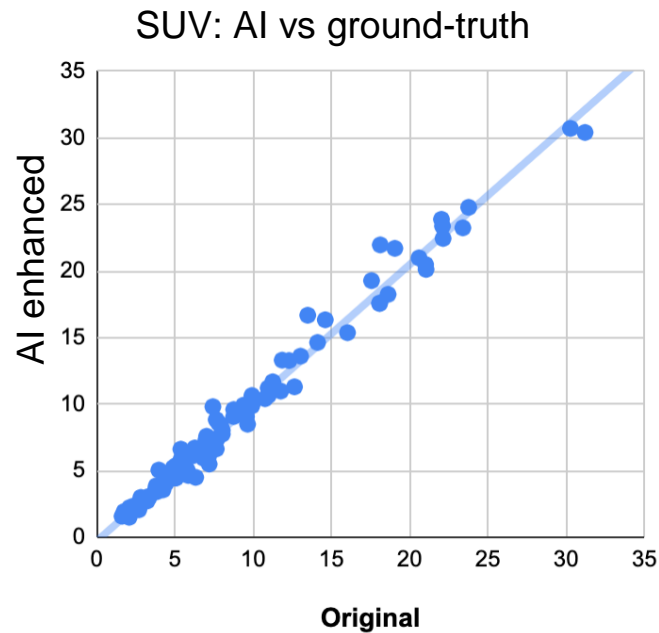
Chen et.al. Radiology 2019
Gong et.al. RSNA 2019
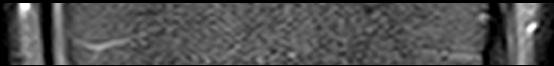*Xu et.al. SPIE 2020*

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AI enhanced MRI acquisition

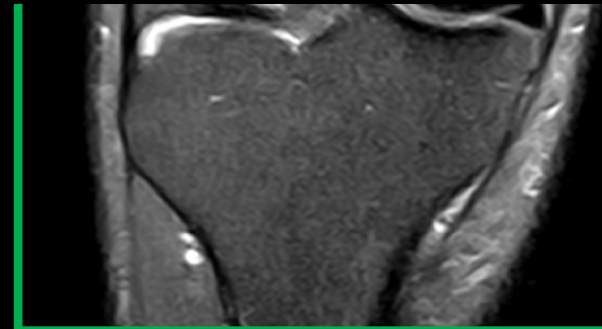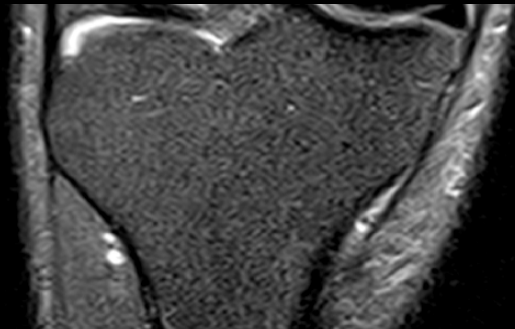## Better Image Quality, Signal-to-noise and Resolution

AI Enhancement

ECR 2020: "CNN based DL enhances perceived quality, SNR and resolution at ~30% less scan time" – Ltanenbaum, et. al.
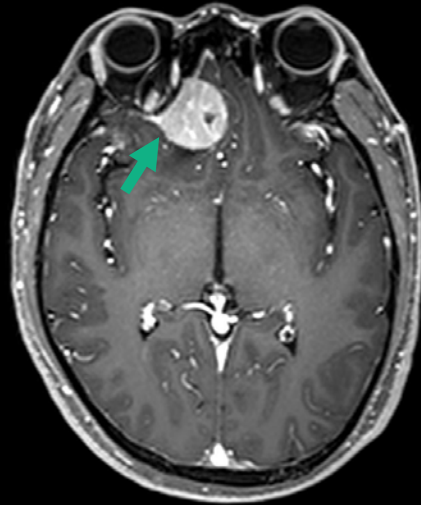
ASNR 2020: "Deep Learning AI Technology Matches Lumbar Spine Image Quality at about 1/3 of the Scan Time" – Ltanenbaum, et. al.

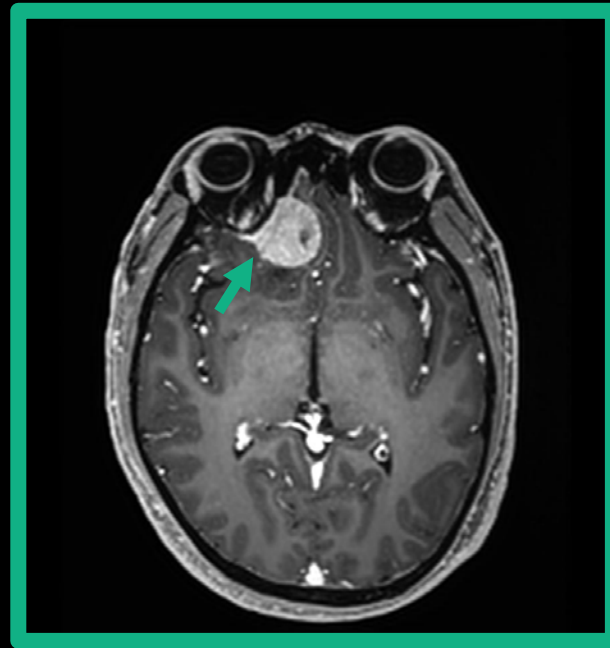3T 2D Cor STIRSiemens TA - 2:48

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AI improves quality of images with 10% Gadolinium dosage, enabling safer MR exams

Meningioma
Siemens 3T

GBCA Dose

0.1 mmol/kg

0.01 mmol/kg

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NIH
National Institutes
of Health

Gong et.al. JMRI 2018
Gong et.al. RSNA 2018
NIH SBIR 2019