

01 Task operation

Figure 1 coordinate 1 | Subitems 01, 02, 03, 04, 05, 06

Machine learning

01 Synthesis

Noise + condition -> new sample
Learn a sample distribution
Keep requested properties
Test coverage and diversity

02 Translation

Source domain -> target domain
Learn a conditional mapping
Keep relevant subject identity
Pairing changes assumptions

03 Editing

Image + edit -> modified image
Change a specified property
Keep non-target content
Not a treatment counterfactual

04 Restoration / fill

Degraded input -> restored output
Recover or fill missing content
Keep observed information
Separate truth from completion

05 Measurement inverse

Data + operator -> reconstruction
Infer a constrained posterior
Unobserved parts stay uncertain
Noise assumptions matter

06 Temporal generation

Past / action -> future states
Model dependent temporal states
Keep meaningful dynamics
Actions are optional conditions

Computer vision

— Image / texture / shape

Noise / prompt -> visual sample
LDM; Text2Tex
Keep requested attributes
Test fidelity and coverage

— Image-to-image translation

Source -> target appearance
pix2pix; CycleGAN
Keep scene / object structure
Test subject-wise preservation

— Instruction editing

Image + instruction -> edit
InstructPix2Pix
Keep identity outside the edit
Test target / off-target change

— Denoise / enhance / inpaint

Partial image -> restored image
Palette; DDRM
Keep supported detail
Test false structures

— Inverse reconstruction

Known operator -> image draws
Diffusion posterior sampling
Keep likelihood-supported detail
Test operator shift / calibration

— Video / 4D / world models

History / control -> future view
Video diffusion; Genie; 4D-fy
Keep temporal / action relations
Test unseen actions

Medical image analysis

— MAISI synthetic CT

Masks / metadata -> CT volume
Vary appearance, retain anatomy
Need rare-case and privacy QA
Test held-out real-task utility

— Synthetic CT / virtual stain

MRI -> CT; tissue -> stain
MR-only RT; virtual histology
Need subject-specific fidelity
Test dose / pathology and QA

— Anatomic digital siblings

Local edit -> related anatomy
Diffusion-based local editing
Need controlled variation
Test local truth and invariants

— Microscopy / region filling

Degraded to enhanced content
Microscopy; MAISI tumor fill
Separate recovery / simulation
Test hallucination + task error

— MRI / sparse-view CT

k-space / projections -> image
Score-based medical inversion
Need patient / lesion fidelity
Test data shifts / decision error

— Cardiac cycles / ultrasound

Phase / pose -> anatomy / view
CHear; Mesh Flow; SonoWorld
Need local motion / action truth
Test against static / replay