Day 3

Convex Optimizations.

Minimize objective → convex optimization.

max → ~~convex~~ concave.

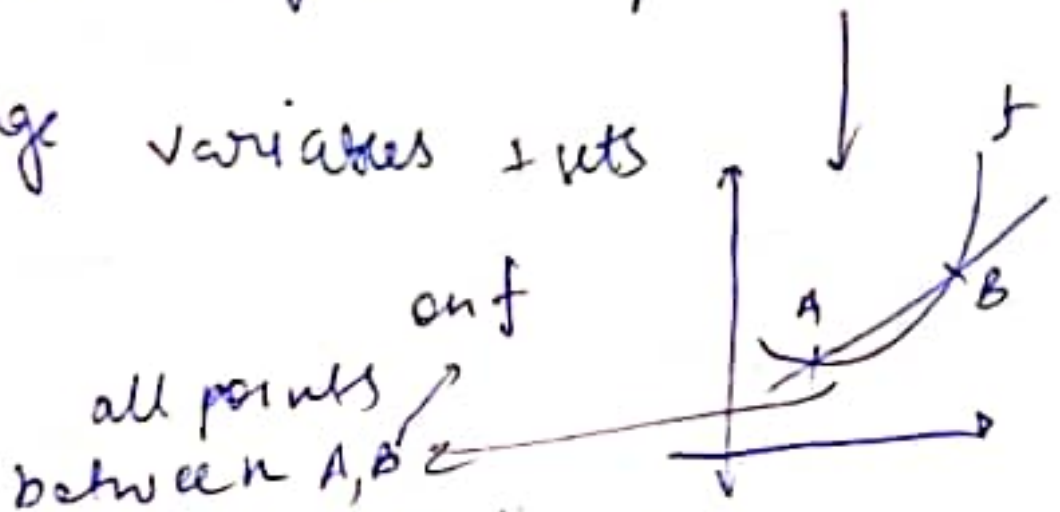
polynomial time:

→ MDL.

least squares + linear programming + convex optimization.

↓

solve system of eqn, for large variables + lots



all points on f between A, B should be below line

video fouus. → reduce noise on bounding boxes.

modify vertices of rectangle.

L1 & L2 regularization
↳ simple diff
diff squares.

remove noise from signal ⇒ keep penalizing 1st, 2nd, 3rd order differences.

1^{st} $x_{t+1} - x_t$

2^{nd} $(x_{t+2} - 2x_{t+1} - x_t)$ → L1 → more fine tuning.

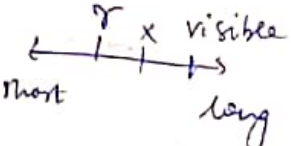
II Medical Imaging

Medical Images
↳ multiple modalities.

excite → with
↓ body
↓ sensor
① sound / ultrasound
② light
③ radioactive / X-Ray.
④ Nuclear / γ-Ray (shorter freq.)

imaging → depends on ambient conditions.

⑤ MRI
⑥ CT
⑦ Microscopy



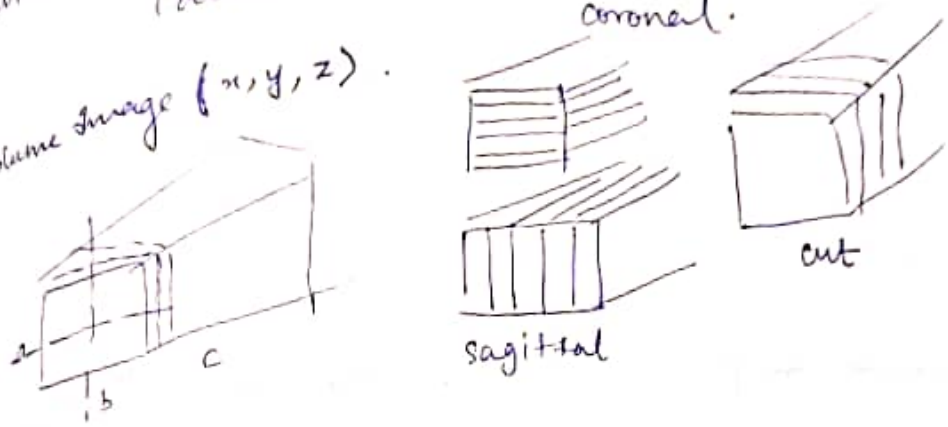
WWII → SONAR.

had all ready for nutrition
so glucose + radio solut gets absorbed.
↳ decays + emits } scanner detects.

imaging provides → Structural info.
→ Functional

* CT Scan *
computed tomography.
microscopy → light, electron, tunelling electron.
in vivo imaging – live body
(dead more informative).

Volume Image (x, y, z).



avg. brightness in unit area.

a = b = c isotropic

a = b

c > a, b.

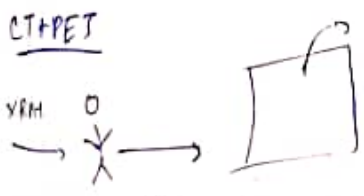
3D → 2D (3D space, 1D time)

↓

5D + 2 every pt you store extra info.
vector value img.

(Scanners)

CT+PET



$$I_0(r) = I_{in}(r) e^{-\int \mu(r) dx}$$

(linear attenuation coeff.)

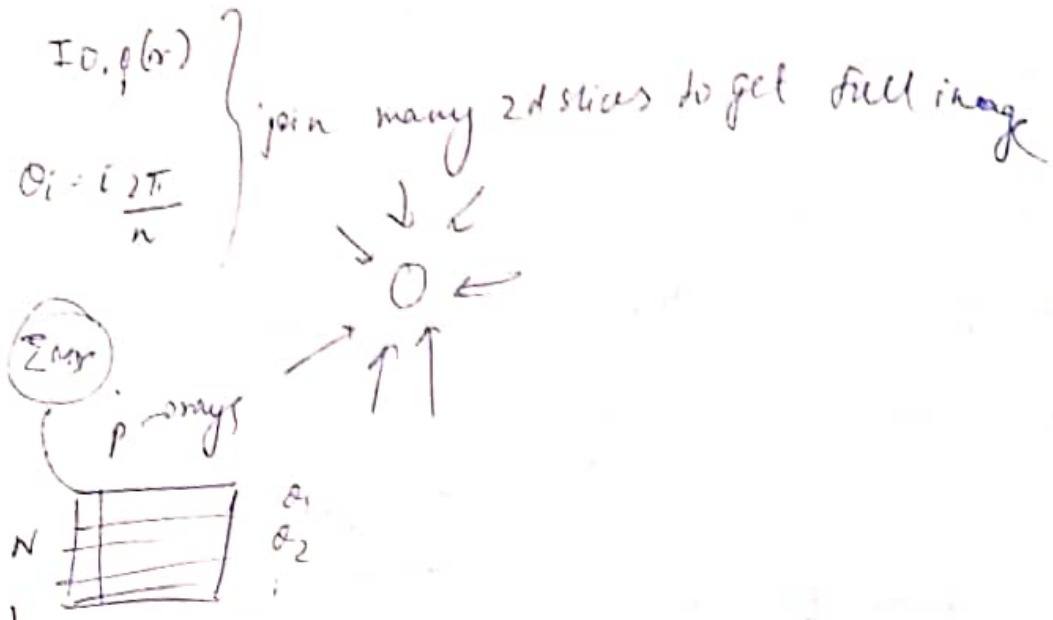
sensed signal data.

$$\log\left(\frac{I_0(r)}{I_{in}(r)}\right) = -\int \mu(r) dl(r) \Rightarrow \mu(r)$$ → desired 2D X Ray image.

$I_0, \phi(r)$

$\theta_i = i \frac{2\pi}{n}$

} join many 2D slices to get full image



↓

Backprojection

(filtering) => causes tissues acuity

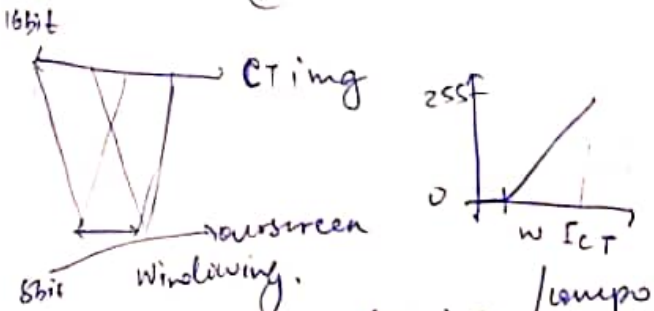
Reconstructed image. have very different attenuation.

normalized CT value ~ Hounsfield value U.

2^n

-1024 to 1024 → no. of bits 12

CT image voxel depth. → 12-16 bits.
(pixel)



contrast stretching / composing reconstructed image.

CT reconstruction

Radon transform