Foundations of ML & DL:

↳ Basics of ML → Tasks
  ↳ methods
  ↳ intuition.

↳ Introduction to DL → Perceptron
  ↳ MLP

Q) What is the difference b/w (DL), (ML), (AI)?

→ hand crafted features.
  + learning algo.

→ feature are learnt by
  the learning algo.

Eg: I → model ⤨ cat
                  → dog.

Eg) I → human → face
              → tail
              → color
              → breed.
         features.
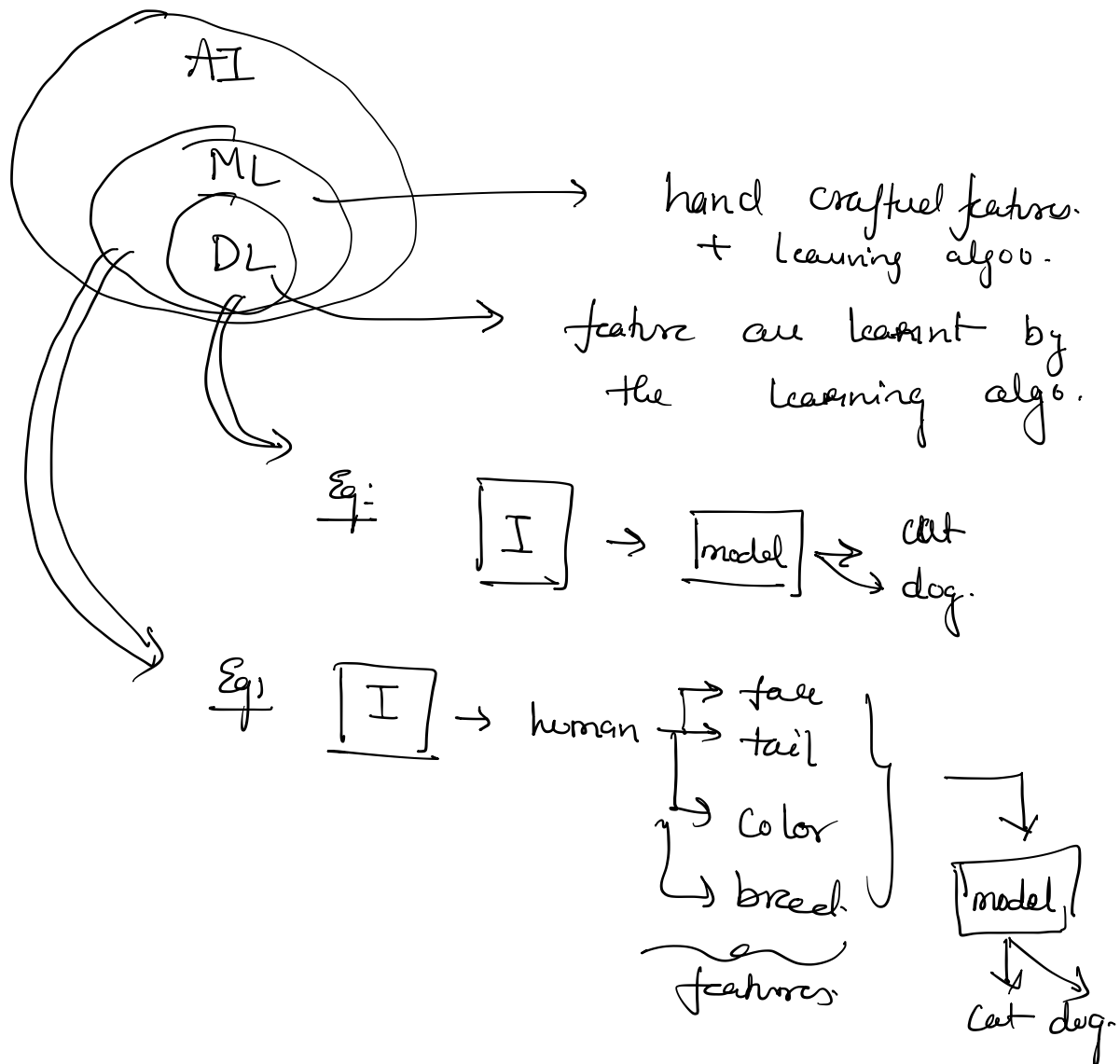
→ model
   ↓
  cat dog.

What is a model?

Live Score

Location

prev. history

i/p → | Model | → o/p.

→ Search results
→ your feedback (clicks)

Learnt (to do)
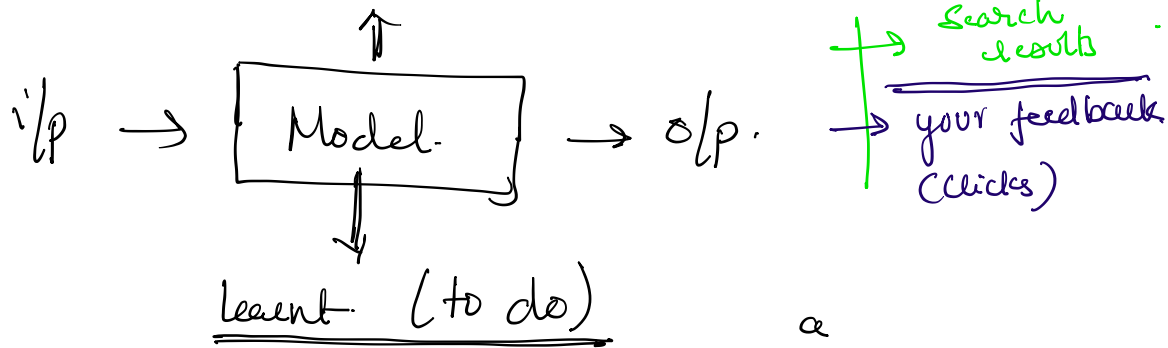
given task $\underline{T}$ from experience $\underline{E}$ with a performance $\underline{P}$.

Learning as $\underline{E}\uparrow \Rightarrow \hat{P}$ on Task $\underline{T}\uparrow$

↳ as you have more $\underline{data} \approx E \Rightarrow \underline{Performance}\uparrow$

(E) Data → | i/p | → **AI/ML/DL** | model (T) | → Predictions | o/p | → error

update → Learning algo ←

↳ Optimization algorithms

Ground truths. | expected o/p |

Loss function or cost function or Objective fn.

(P) Performance metric.

Pipeline overview:-

```
                                    ┌─────────────────┐        ┌──────────┐
                                    │ Performance     │ ←────  │ GT ✓     │
                                    │ metrics         │        └──────────┘
                                    └─────────────────┘              │
                                            ↑                        ↓
┌──────────┐      ┌──────────┐      ┌──────────────┐ ✓      ┌──────────┐
│ Data     │ ───→ │ Model    │ ───→ │ Predictions  │ ───→   │ Loss fn. │ ✓
└──────────┘      └──────────┘      └──────────────┘        └──────────┘
  (I/P)                                   (o/p)
    ✓               ↑                                              │
                    │                                              ↓
         update  ┌──┘           ┌──────────────────────────┐ ✓
          ─────  └───────────── │  Optimization algo.      │ ←──
                                └──────────────────────────┘
```
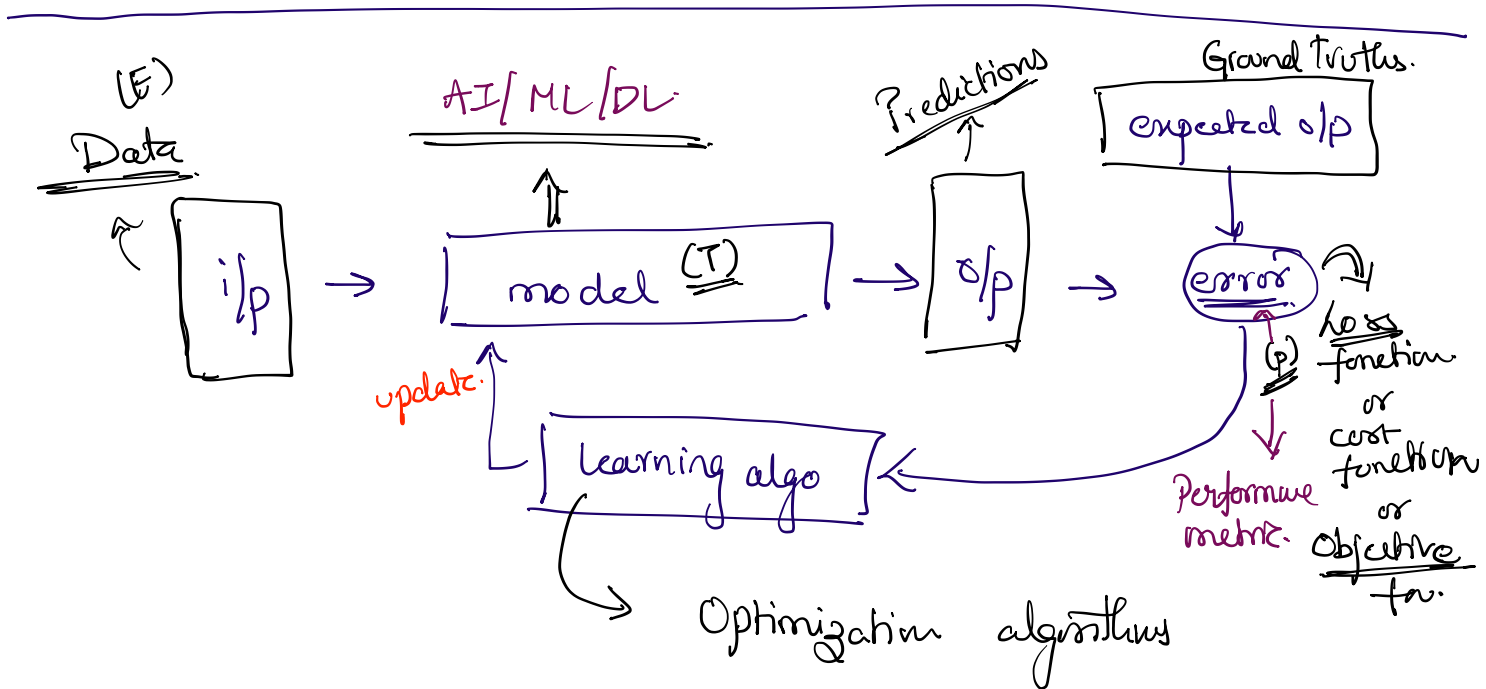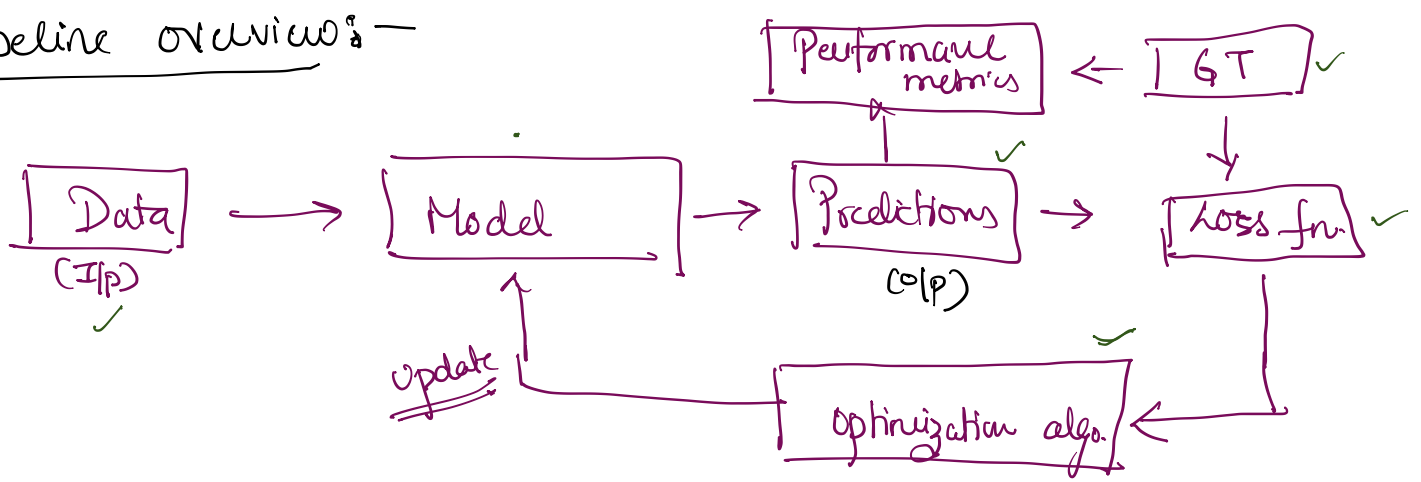
Loss fn: | Error fn | Objective fn:

Analogy :—

```
        i/p                                     o/p        GT
      ┌──────┐      ┌──────────────┐
      │  2   │ ───→ │ model        │ ───→      4.5          5
      │      │      │ (addition)   │                        ↘
      │  3   │      └──────────────┘                         ↙
      └──────┘             │                       error fn = L_1
                           ↓
                          T.
```
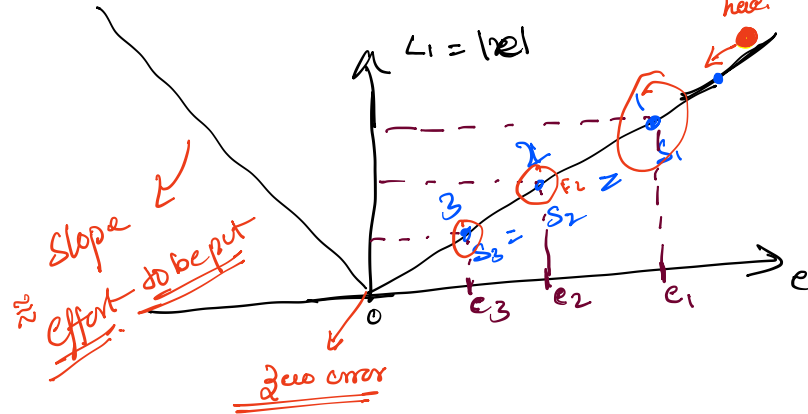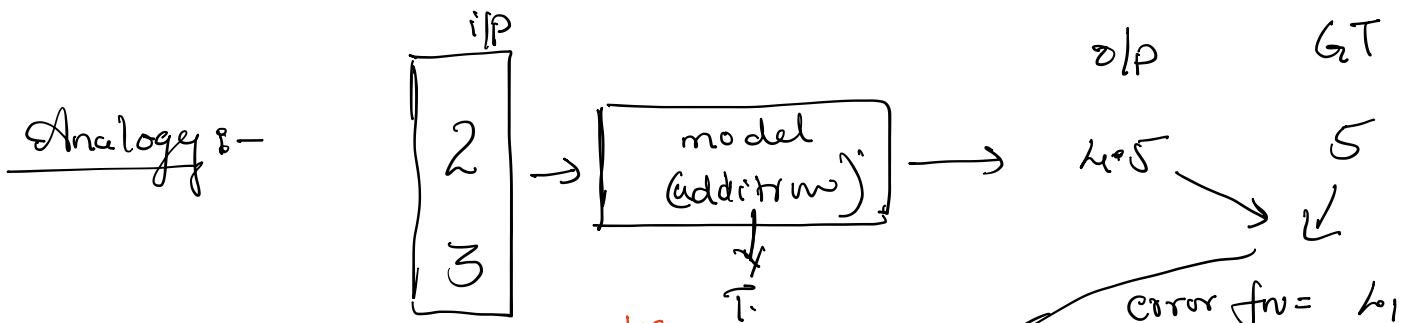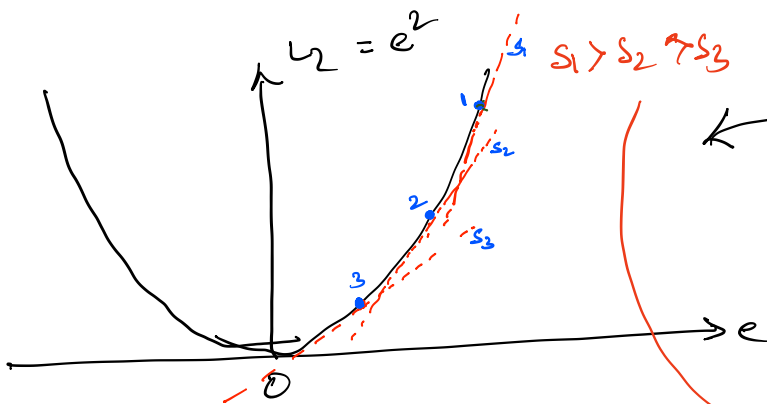
$$L_1 = |a - b|$$

$$L_1 = \boxed{0.5}$$

$$L_2 = (a - b)^2$$

$$L_2 = 0.25$$

$L_1 = |e|$

Slope ∠
effort to be put
Zero error

O e_3 e_2 e_1 → e

here.

S_3 S_2 (blue markings 3, 2, 1)

$L_2 = e^2$ $S_1 > S_2 > S_3$

S_2 S_3

O → e

Eg: amount of effort in improving ∧ when getting

$70\% \neq 80\% \neq 90\%$

Yes / **No?**

→ **Gradient Descent** (Algorithm)

 ↘ (Slope) with direction.

Scalar quantity.   → vector quantity