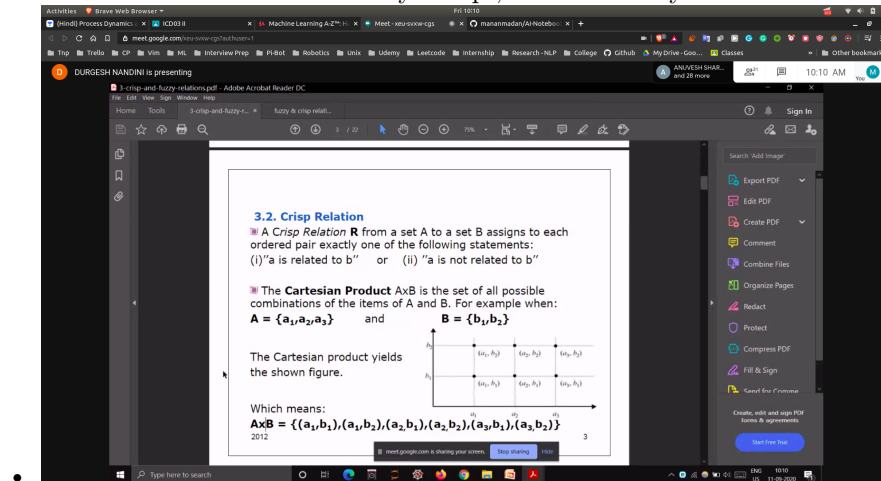
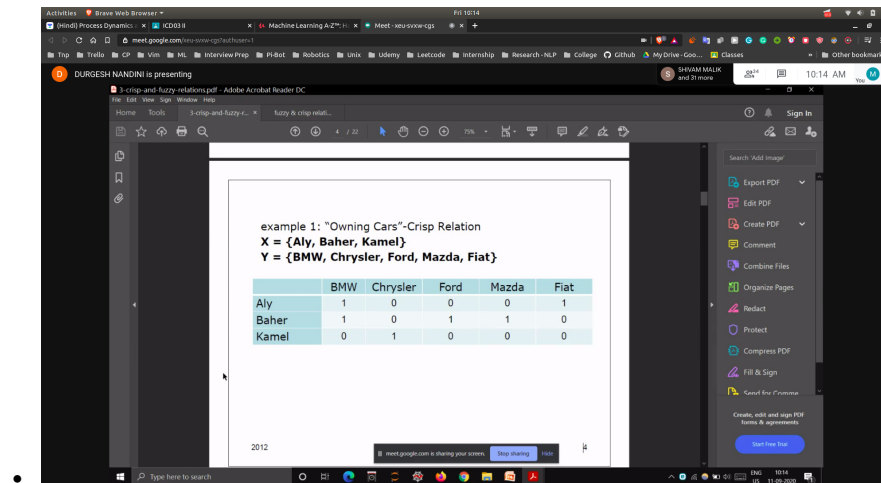


Relations

- Uptill Now we have talked about crisp relations
- Relations are not always 0 or 1
- But in real life the relations can be between (0 and 1)
- These relations are not always crisp, it can be fuzzy also

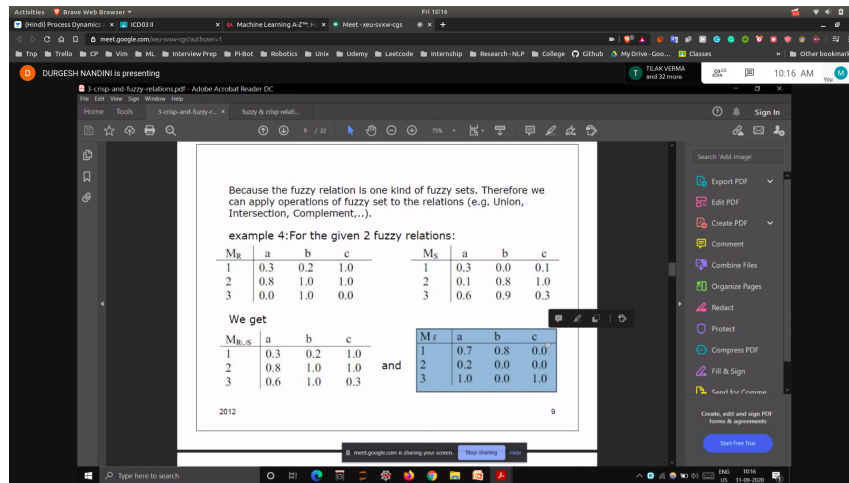


Example



Fuzzy Relations

- They are represented in the form of matrices



Operations on Fuzzy Relations

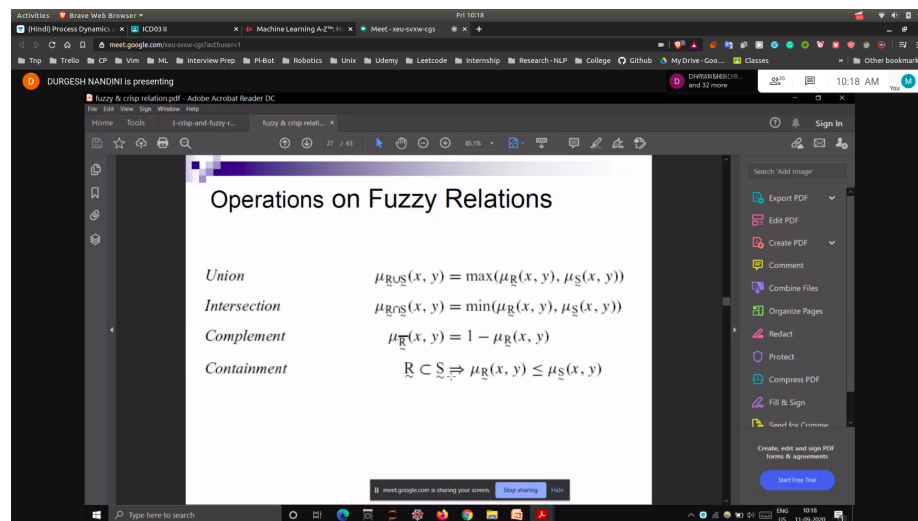
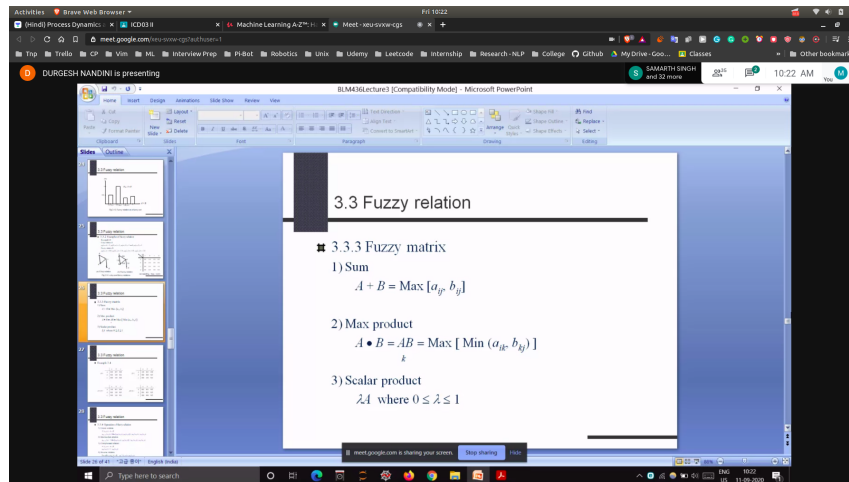


Figure 1: fuzzy_rel

-
- If a fuzzy set has a value of 1, then it is called identity set

Operations on Fuzzy Matrix



The screenshot shows a Google Meet window with a presentation titled "3.3 Fuzzy relation". The presentation content is as follows:

3.3 Fuzzy matrix

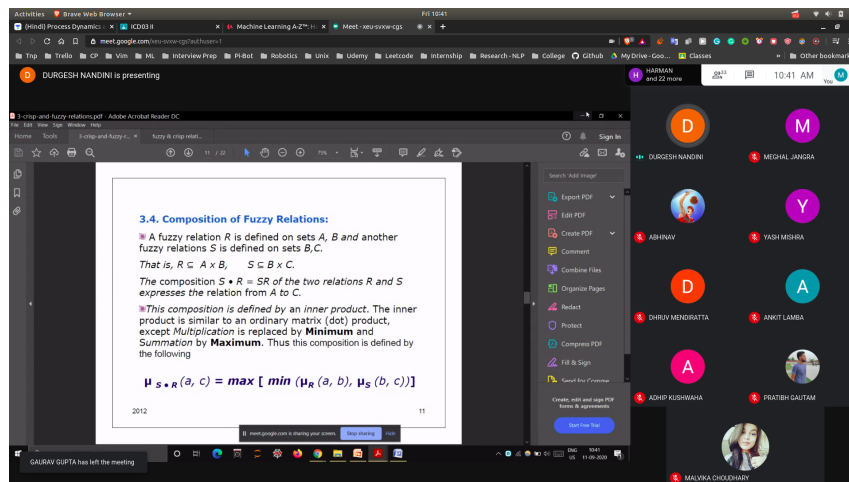
- 1) Sum

$$A + B = \text{Max} [a_{ij}, b_{ij}]$$
- 2) Max product

$$A \bullet B = AB = \text{Max}_k [\text{Min} (a_{ik}, b_{kj})]$$
- 3) Scalar product

$$\lambda A \text{ where } 0 \leq \lambda \leq 1$$

Composition on Fuzzy Relations



The screenshot shows a Google Meet window with a PDF document titled "3.4. Composition of Fuzzy Relations". The document content is as follows:

3.4. Composition of Fuzzy Relations:

A fuzzy relation R is defined on sets A, B and another fuzzy relations S is defined on sets B, C .
 That is, $R \subseteq A \times B, S \subseteq B \times C$.
 The composition $S \circ R = SR$ of the two relations R and S expresses the relation from A to C .

This composition is defined by an inner product. The inner product is similar to an ordinary matrix (dot) product, except Multiplication is replaced by **Minimum** and Summation by **Maximum**. Thus this composition is defined by the following

$$\mu_{S \circ R}(a, c) = \text{max} [\text{min} (\mu_R(a, b), \mu_S(b, c))]$$