Nama: Hendrikus Yohanes Wunga

Nim : 225314039

age	income	student	credit_rating	com
<=30	high	no	fair	no
<=30	high	no	excellent	no
31…40	high	no	fair	yes
>40	medium	no	fair	yes
>40	low	yes	fair	yes
>40	low	yes	excellent	no
31…40	low	yes	excellent	yes
<=30	medium	no	fair	no
<=30	**low**	**yes**	**fair**	**yes**
>40	medium	yes	fair	yes
<=30	**medium**	**yes**	**excellent**	**yes**
31…40	medium	no	excellent	yes
31…40	high	yes	fair	yes
>40	medium	no	excellent	no

Diketahui:

- Jumlah total data: 14
- Fitur yang di ketahui:
  - Age = 31 ... 40
  - Income = low
  - Student = no
  - Credit_rating = fair
  - Rumus Naive Bayes (dengan Koreksi Laplace):

$$P(X|C) = \frac{count(X,C)+1}{N_c + |V|}$$

$$P\ (\ C|X_1,....,X_n\ ) \propto P\ (C).\prod_{i=1}^{n} = P(X_1|C)$$

Ditanya:

- Apakah orang dengan age=31...40, income=low, student=no, dan credit_rating=fair akan membeli komputer (buys_computer=yes) atau tidak (buys_computer=no)?

- Secara matematis, kita ingin membandingkan:
  - P(buys_computer=yes|age=31...40,income=low,student=no,credit_rating=fair) dengan,

- P(buys_computer=no|age=31...40,income=low,student=no,credit_rating=fair)P(buys_computer=no|age=31...40,income=low,student=no,credit_rating=fair)

Pengerjaan :

A. Hitung Probabilitas Pior
   - *P(buys_computer=yes) = P(yes)* = $\frac{9}{14}$ = 0.643
   - *P(buys_computer=no) = P(no)* = $\frac{5}{14}$ = 0.357

B. Hitung Probabilitas Bersyarat (dengan Koreksi Laplace):

   Rumus: $P(X|C) = \frac{count(X,C)+1}{N_c + |V|}$

   dimana:

   - **X** adalah fitur (misalnya, "age=31...40")
   - **C** adalah kelas (yes atau no)
   - $count(X,C)$ Adalah kemunculan fitur **X** di kelas **C**
   - N_c adalah jumlah todal data di kelas **C**
   - $|V|$ adalah jumlah nilai unik yang mungkin untuk fitur **X**

   a. Untuk buys_computer = yes:
      - **P(age = 31...40 | yes):**
        - *count*(age=31...40,yes)=3
        - N_{yes} = 9
        - $|V|_{age}$= 3 (<=30, 31...40, >40)
        - P(age=31...40|yes) = $\frac{3+1}{9+3}$ = $\frac{4}{12}$ = 0.333
      - **P(income = low | yes):**
        - *count*(income=low,yes)=2
        - N_{yes} = 9
        - $|V|_{income}$= 3 (low,medium,high)
        - P(income=low|yes) = $\frac{2+1}{9+3}$ = $\frac{3}{12}$ = 0.250
      - **P(student = no | yes):**
        - $count\ (\ student = no,yes) = 2$
        - N_{yes} = 9
        - $|V|_{student}$= 2 (yes,no)
        - $P(student) = no\ |yes) = \frac{2+1}{9+2} = \frac{3}{12} =$ 0.273

- P(creditRating=fair|yes):
  - $count\left(creditRating = fair,yes\right) = 5$
  - $N_{yes} = 9$
  - $|V|_{creditRating}$= 2 (fair,excellent)
  - $P\left(creditRating\right) = fair\left|yes\right) = \frac{5+1}{9+2} = \frac{6}{11} = 0.545$

b. Untuk buys_computer = no:

- **P(age = 31...40 | no):**
  - $count$(age=31...40,no)=0
  - $N_{no} = 5$
  - $|V|_{age}$= 3
  - P(age=31...40|no) = $\frac{0+1}{5+3} = \frac{1}{8} = 0.125$
- **P(income = low | no):**
  - $count$(income=low,no)=1
  - $N_{no} = 5$
  - $|V|_{income}$= 3
  - P(income=low|no) = $\frac{1+1}{5+3} = \frac{2}{8} = 0.250$
- **P(student = no | no):**
  - $count\ (\ student = no,no) = 4$
  - $N_{no} = 5$
  - $|V|_{student} = 2$
  - $P\left(student\right) = no\left|no\right) = \frac{4+1}{5+2} = \frac{5}{7} = 0.714$
- P(creditRating=fair|no):
  - $count\left(creditRating = fair,no\right) = 2$
  - $N_{no} = 5$
  - $|V|_{creditRating}$= 2
  - $P\left(creditRating\right) = fair\left|no\right) = \frac{2+1}{5+2} = \frac{3}{7} = 0.429$

C. Probabilitas Posterior (Sebelum Normalisasi):

- $P(yes|X) \propto P(yes) \times P(age|yes) \times P(income|yes) \times P(student|yes) \times P(creditRating|yes)$
  - $P(yes|X) \propto 0.643 \times 0.333 \times 0.350 \times 0.273 \times 0.545 = 0.0079$
- $P(no|X) \propto P(no) \times P(age|no) \times P(income|no) \times P(student|no) \times P(creditRating|no)$
  - $P(no|X) \propto 0.357 \times 0.125 \times 0.250 \times 0.714 \times 0.429 = 0.0034$

D. Normalisasi Probabilitas Posterior:

- $P(yes|X)=\frac{0.0079}{0.0079+0.0034}=\frac{0.0079}{0.0113}=0.699\approx 0.70$
- $P(no|X)=\frac{0.0034}{0.0079+0.0034}=\frac{0.0034}{0.0113}=0.301\approx 0.30$

Karena $P(yes\,|X)=0.70>P(no|X)=30$, prediksi adalah **YES (akan membeli komputer)**