



INFORMATIONSFABRIK

DATEN VERSTEHEN, ENTSCHEIDUNGEN TREFFEN

Hacksession Image Recognition

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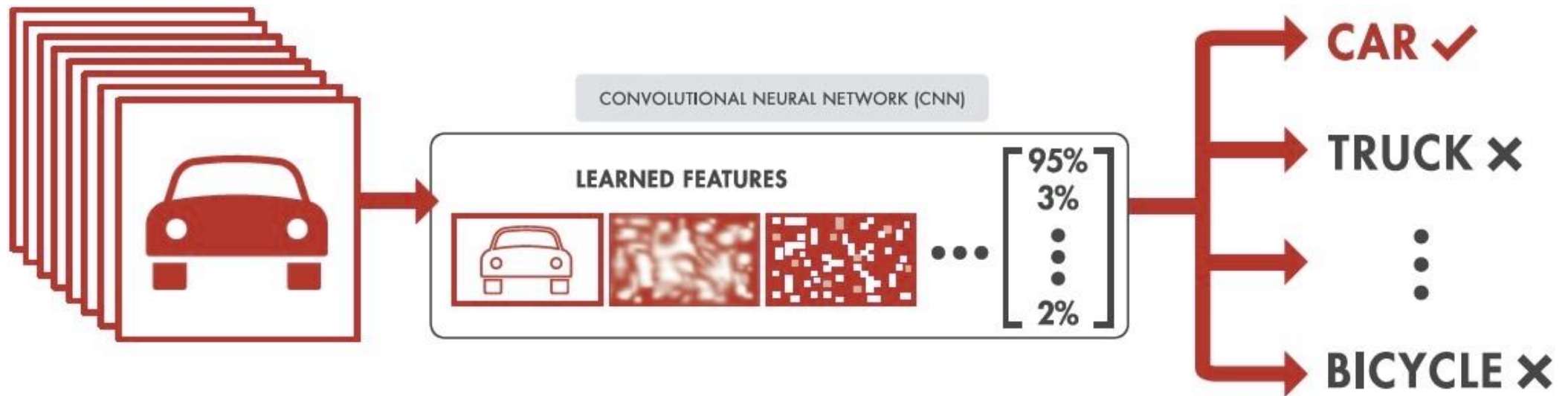
Outline



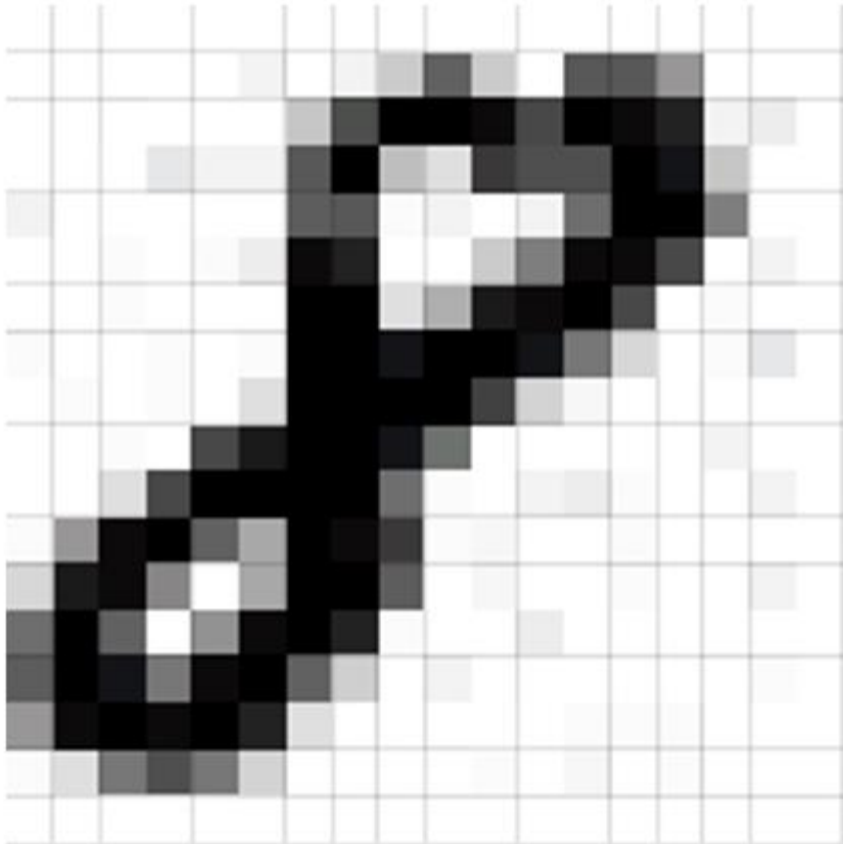
1	Intro Image Recognition
2	Object Detection and YOLO
3	Session Targets
4	Setup & Code Intro

Intro Image Recognition

Image classification in a nutshell



Images are matrices



```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 12 0 11 39 137 37 0 152 147 84 0 0 0
0 0 1 0 0 0 41 160 250 255 235 162 255 238 206 11 13 0
0 0 0 16 9 9 150 251 45 21 184 159 154 255 233 40 0 0
10 0 0 0 0 0 145 146 3 10 0 11 124 253 255 107 0 0
0 0 3 0 4 15 236 216 0 0 38 109 247 240 169 0 11 0
1 0 2 0 0 0 253 253 23 62 224 241 255 164 0 5 0 0
6 0 0 4 0 3 252 250 228 255 255 234 112 28 0 2 17 0
0 2 1 4 0 21 255 253 251 255 172 31 8 0 1 0 0 0
0 0 4 0 163 225 251 255 229 120 0 0 0 0 0 11 0 0
0 0 21 162 255 255 254 255 126 6 0 10 14 6 0 0 9 0
3 79 242 255 141 66 255 245 189 7 8 0 0 5 0 0 0 0
26 221 237 98 0 67 251 255 144 0 8 0 0 7 0 0 11 0
125 255 141 0 87 244 255 208 3 0 0 13 0 1 0 1 0 0
145 248 228 116 235 255 141 34 0 11 0 1 0 0 0 1 3 0
85 237 253 246 255 210 21 1 0 1 0 0 6 2 4 0 0 0
6 23 112 157 114 32 0 0 0 0 2 0 8 0 7 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Filters can *match patterns*



$$\begin{pmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{pmatrix}$$

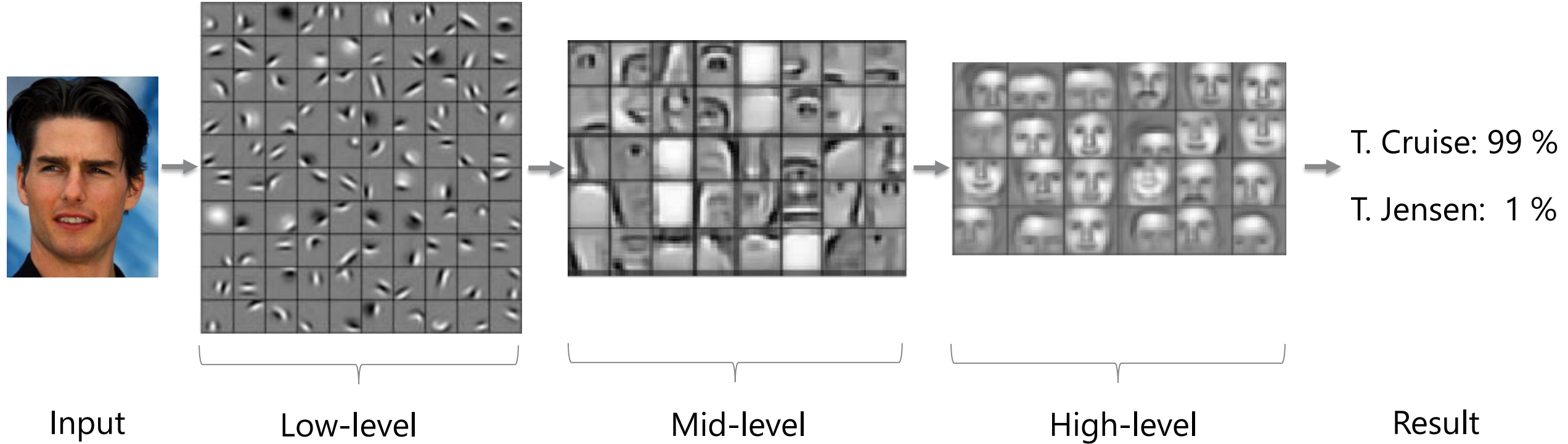


Applying multiple filters



Input

To detect more complex features: apply filters after filters



Object detection & YOLO

Types of Image Recognition Tasks



Classification



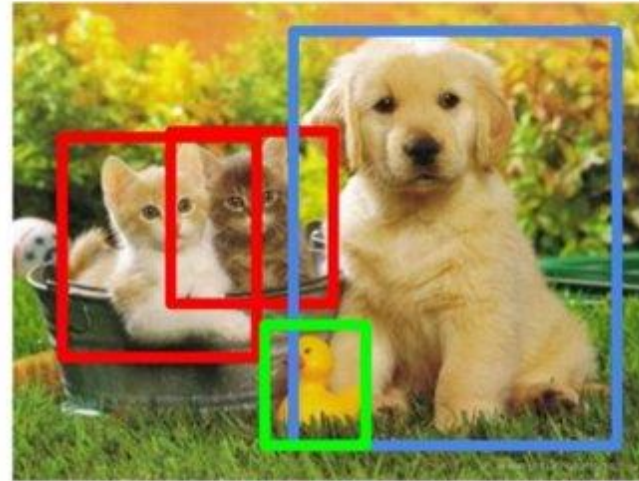
CAT

**Classification
+ Localization**



CAT

Object Detection



CAT, DOG, DUCK

**Instance
Segmentation**



CAT, DOG, DUCK

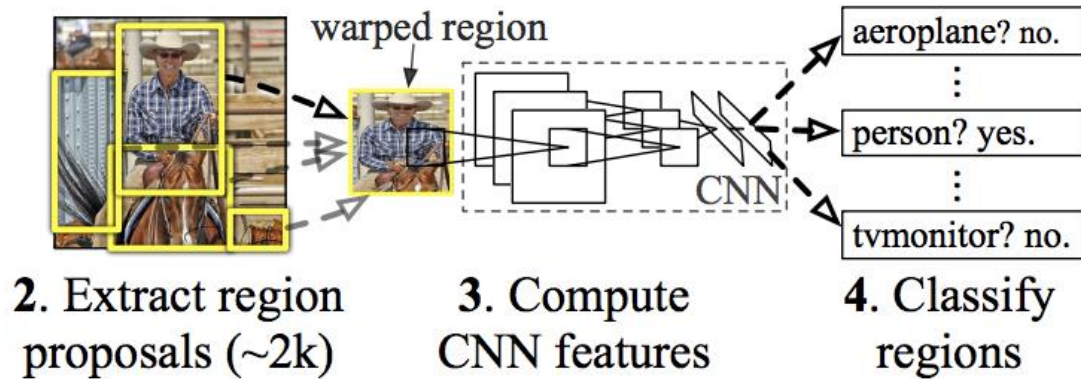
Single object

Multiple objects

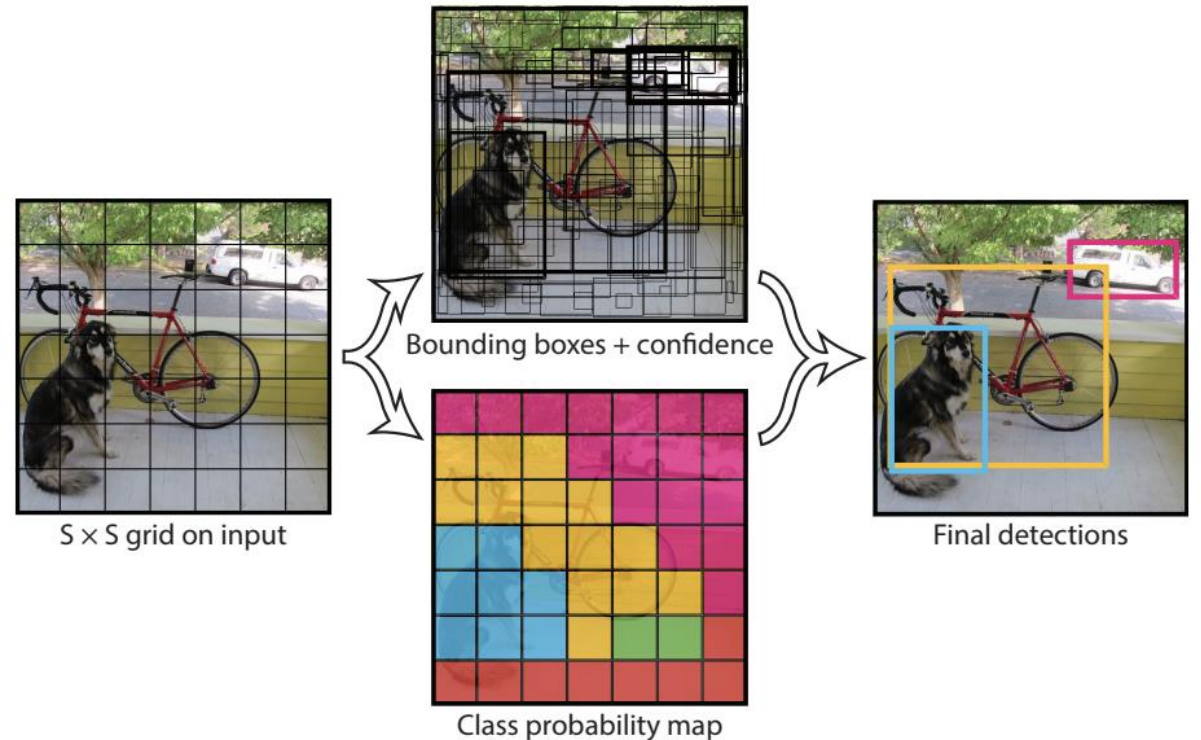
YOLO – „you only look once“



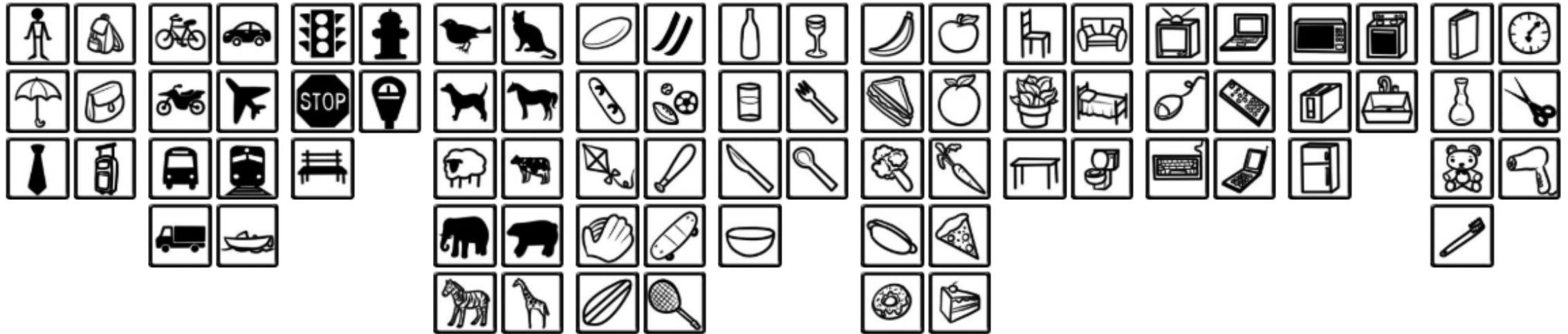
Conventional Object Detection
separately proposes and classifies 'boxes'



YOLO ("you only look once")
parallelizes proposing and classifying 'boxes'



Network pre-trained on COCO-Dataset



- 80 object classes
- 330.000 images
- Networks pre-trained on COCO dataset freely available

Session Targets



Agenda



1. **Form groups** (2-3 persons each, 1 Google account per group)
2. **Intro into sample code**
3. **Diving into sample code** with Google Colab
4. **Choose a new use case**, and code it with your group
 - *How many bicycles?*
 - *Delivery trucks? (trucks only allowed at limited hours)*
 - *Remove certain objects from an image?*
 - **< your idea here >**
5. **16:30-16:45: present your results** to us

Setup & Code Intro

Contact



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