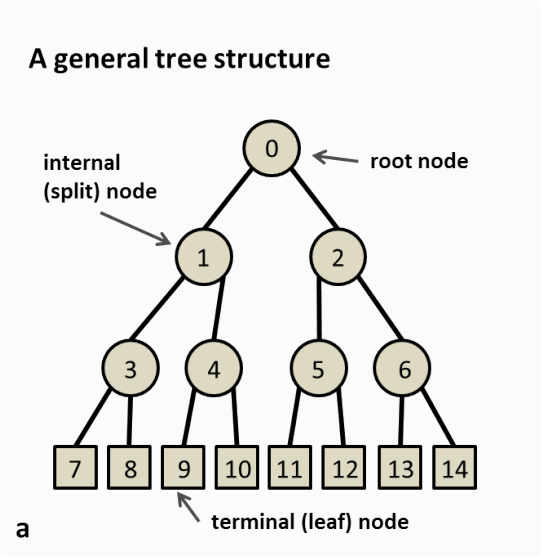
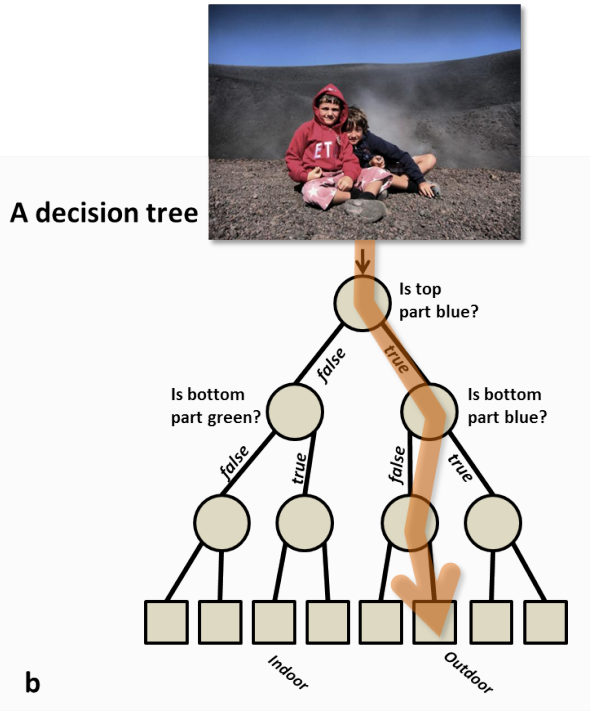
Decision Trees and Random Forests

- **Decision trees** - predict the class/value of a target variable using a sequence of decisions applied to the set of features
- **Ensemble of trees (random forests)** do a great job at prediction
- Popular applications of random forests:
  - Computer vision, i.e. face detection software (Viola and Jones 1998)
  - Medical imaging
  - XBOX Kinect





Microsoft Kinect for XBOX 360

- Guinness World Record of being the "fastest selling consumer electronics device" (8 million in first 60 days)

• Microsoft Kinect for XBOX 360 - Algorithm

- Classification Problem: Which body part a pixel belongs to?
- Data: pixel
- Features: Differences in depth from a reference pixel p to a probe pixel r
- Target: 30 body parts (right arm, left arm, head shoulder, left leg, etc)

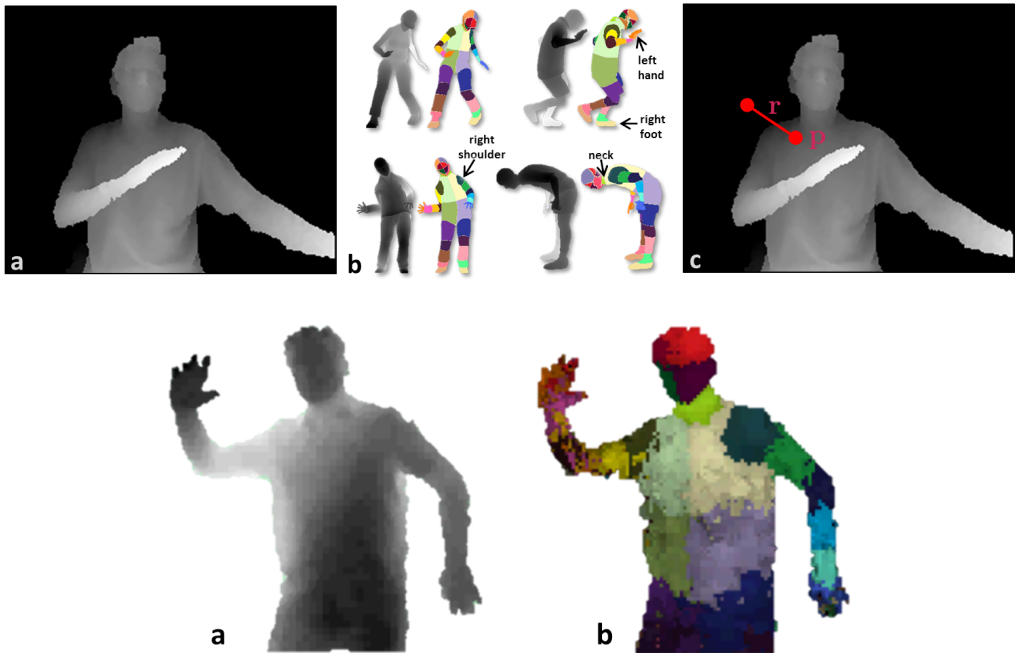


Fig. 3.16: **Classification forests in Kinect for XBox 360. (a)** An input depth frame with background removed. **(b)** The body part classification posterior. Different colours corresponding to different body parts, out of 31 different classes.

References

A. Criminisi, J. Shotton, and E. Konukoglu *Decision Forests for Classification, Regression, Density Estimation, Manifold Learning and Semi-Supervised Learning*, Microsoft Research Technical Report TR-2011-114