Introduction to Machine Learning

Lecture 6: Conclusion

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Outline

This lecture includes:

- A **model selection** lab
- A few aspects of machine learning we have not mentionned
  - **Feature engineering**
  - **Dimensionality reduction**
- Feedback and final Q&A

Dimensionality reduction

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- There are too many samples
- There are too many features
- Some of the features bring no information

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Hence, there is a need to pre-process the data.

Dimensionality reduction

In case there are too many samples, a simple solution is to apply subsampling, *e.g.* just take into account 10% of the samples.

- Recall the mini-batch k-means
- Be careful with the **class balance**
  - Imbalanced classes: **subsample the majority class**
  - Little to no imbalance: **Stratified sampling**

Dimensionality reduction with PCA

Feature engineering

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Feature engineering is often **data-dependent**: You won't use the same features from text data and from images or videos.

Feature engineering in text analysis: TF-IDF

There are several challenges when dealing with text data:

- Mining text can lead to a huge amount of data to process
- Not all the data is relevant
- Texts can be of different size
- ...

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Hence, there is **a need to preprocess** it before giving it to any ML algorithm.

Feature analysis in image processing

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- Rotation
- Difference scales
- Affine transformation
- (Affine) intensity change

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SIFT = Scale-Invariant Feature Transform. Invariance to:

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SIFT is patented and cannot be used in all situations: There exist alternatives based on the same idea such as SURF (Speeded-Up Robust Features)

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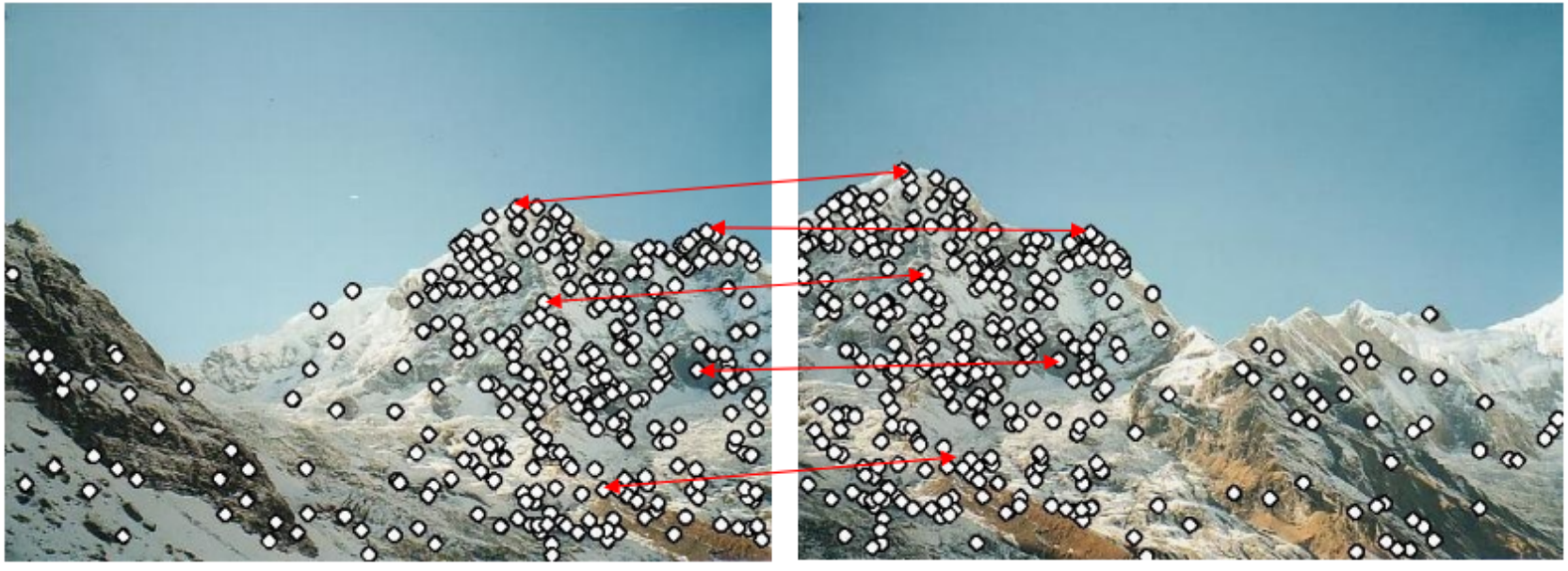
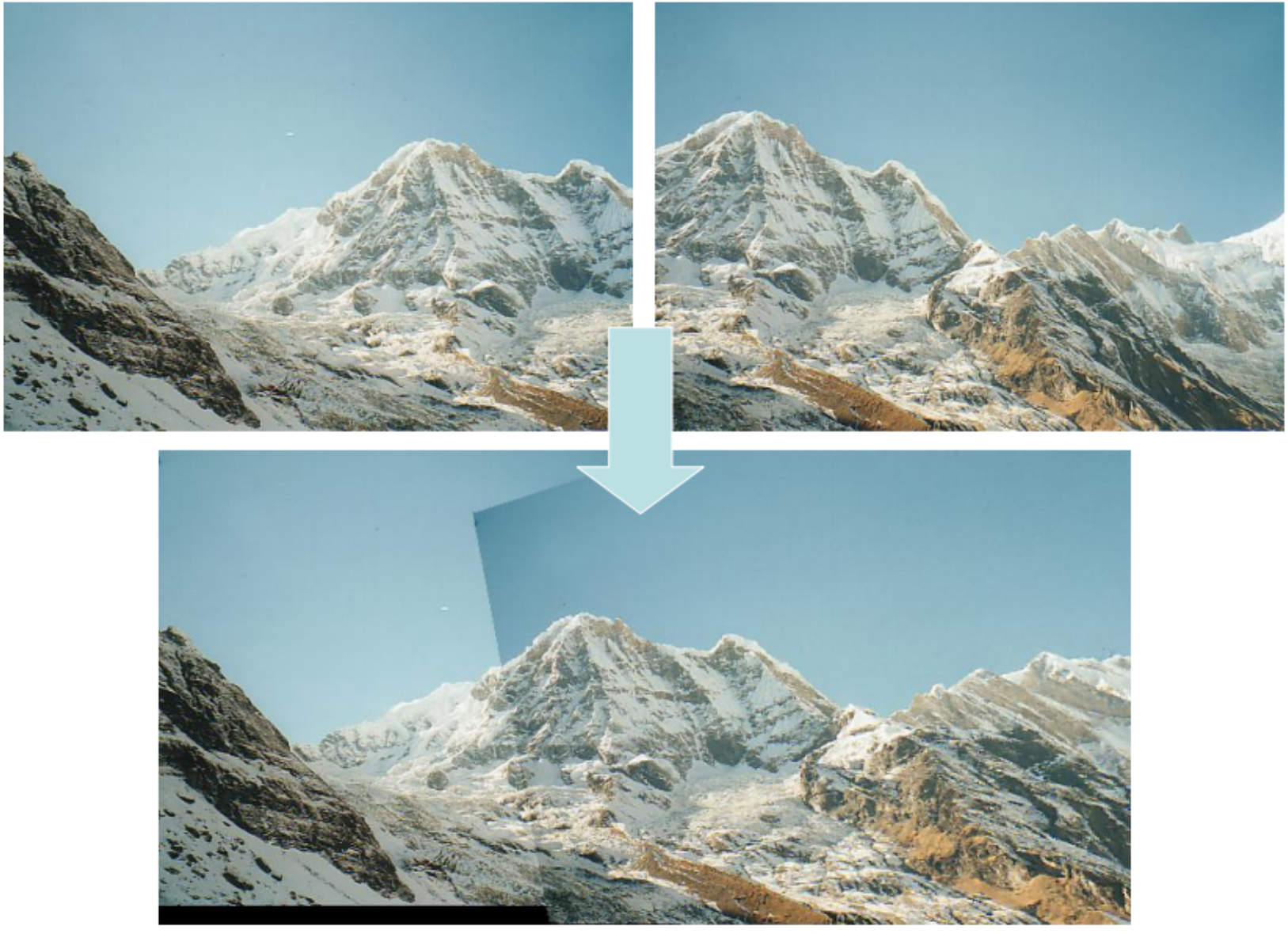


SIFT illustration



Conclusion of the conclusion

Thank you! Questions?
Any feedback?