Human Activity Prediction on Nonlinear Manifolds

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Abstract

Hopefully we have some nice results. The abstract must be limited to one paragraph.

1 Progress Report

Instructions from the course website say:
Submit the progress report detailing your progress towards your goal. Typed (LaTeX) summarizing your literature search, specifying what data sets you are using, and what methods you are applying. The write-up should be 3 to 5 pages for a 1 person group, 6 to 8 pages for a 2 person group and 8 to 10 for a 3 person group.

2 Introduction

Motivation goes here. Probably put some citations too.

3 The Game Plan

I think this is the story we largely are trying to tell:

1. Can we use cell phone data to accurately and consistently distinguish between the activities people are doing? The answer had better be yes because it seems loads of other folks have done so.

   - What techniques are used to do this? Luckily for us, we have this wonderful set of *labeled* (and somewhat diverse) data. So obviously we are probably interested in looking at how supervised learning techniques perform. The amazing thing is that scikit-learn's syntax is basically identical once the data gets set up so it really becomes a plug and chug type of thing after that. Some techniques includes:
   - Support vector machines (SVM)
   - Some deep/crazy-architectured neural network; since this seems to be all the rage these days and since NN claim to be able to catch non-linearness of problems, it seems like a good thing to compare our results to.
   - Decision trees?

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[*]All authors contributed equally. The names are ordered alphabetically.

- SGD classifiers
  - others?

2. But, what I think Prof. Gu is looking for is that we can use manifold learning with linear techniques for an unsupervised set of data. Can we classify accuately with that? Some techniques we may consider
   - k-means
   - PCA
   - Gaussian mixture

4 Our Data

We used the MotionSense data. Blah blah blah.

5 Citations, figures, tables, references

These instructions apply to everyone.

5.1 Citations within the text

The `natbib` package will be loaded for you by default. Citations may be author/year or numeric, as long as you maintain internal consistency. As to the format of the references themselves, any style is acceptable as long as it is used consistently.

The documentation for `natbib` may be found at

```
http://mirrors.ctan.org/macros/latex/contrib/natbib/natnotes.pdf
```

Of note is the command `\citet`, which produces citations appropriate for use in inline text. For example,

```
\citet{hasselmo} investigated\dots
```

produces

Hasselmo, et al. (1995) investigated...

If you wish to load the `natbib` package with options, you may add the following before loading the `nips_2016` package:

```
\PassOptionsToPackage{options}{natbib}
```

If `natbib` clashes with another package you load, you can add the optional argument `nonatbib` when loading the style file:

```
\usepackage[nonatbib]{nips_2016}
```

As submission is double blind, refer to your own published work in the third person. That is, use "In the previous work of Jones et al. [4]," not "In our previous work [4]." If you cite your other papers that are not widely available (e.g., a journal paper under review), use anonymous author names in the citation, e.g., an author of the form "A. Anonymous."

5.2 Footnotes

Footnotes should be used sparingly. If you do require a footnote, indicate footnotes with a number[2] in the text. Place the footnotes at the bottom of the page on which they appear. Precede the footnote with a horizontal rule of 2 inches (12 picas).

Note that footnotes are properly typeset *after* punctuation marks.[3]

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[2]Sample of the first footnote.

[3]As in this example.

	Table 1: Sample table title	
Part		
Name	**Description**	**Size** (µm)
Dendrite	Input terminal	$\sim$100
Axon	Output terminal	$\sim$10
Soma	Cell body	up to 10^6

5.3 Figures

All artwork must be neat, clean, and legible. Lines should be dark enough for purposes of reproduction. The figure number and caption always appear after the figure. Place one line space before the figure caption and one line space after the figure. The figure caption should be lower case (except for first word and proper nouns); figures are numbered consecutively.

You may use color figures. However, it is best for the figure captions and the paper body to be legible if the paper is printed in either black/white or in color.
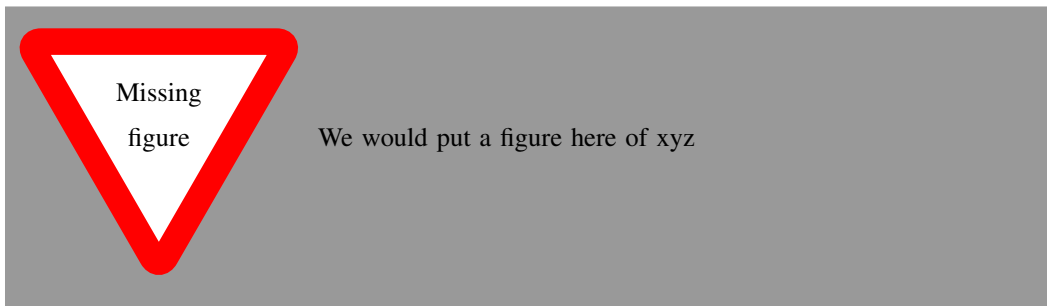

Missing figure

We would put a figure here of xyz

Figure 1: Sample figure caption.

5.4 Tables

All tables must be centered, neat, clean and legible. The table number and title always appear before the table. See Table 1.

Place one line space before the table title, one line space after the table title, and one line space after the table. The table title must be lower case (except for first word and proper nouns); tables are numbered consecutively.

Note that publication-quality tables *do not contain vertical rules.* We strongly suggest the use of the `booktabs` package, which allows for typesetting high-quality, professional tables:

```
https://www.ctan.org/pkg/booktabs
```

This package was used to typeset Table 1.

Acknowledgments

We would like to thank people. Probably our lord and savior Prof. Gu for teaching us everything we know about nonlinear data analysis.[1]

References

[1] Freeman J Dyson. Correlations between eigenvalues of a random matrix. *Communications in Mathematical Physics*, 19(3):235–250, 1970.