Nanomechanical Analysis of Renal Tubular Cell Cytoskeleton to Measure Renal Disease

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TARGET 3·4

REDUCE MORTALITY FROM NON-COMMUNICABLE DISEASES AND PROMOTE MENTAL HEALTH

Abstract

This project investigates changes in mechanical properties of kidney cells when exposed to TGF-β1, which is known to induce renal disease [1]. The aim of this project is to provide insight on the progression of diabetic nephropathy from a mechanical perspective based on changes in mechanical properties observed in single cells using atomic force microscopy.

Lists

Itemize

- item 1
  - subitem 1
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    - subsubitem 2
  - subitem 2
- item 2

Enumerate

1. item 1
   (a) subitem 1
   i. subsubitem 1
   A. subsubsubitem 1
   B. subsubsubitem 2
   ii. subsubitem 2
   (b) subitem 2
2. item 2

Description

desc 1 item 1
desc 1 subitem 1
desc 1 subsubitem 1
desc 1 subsubsubitem 1
desc 2 subsubsubitem 2
desc 2 subsubitem 2
desc 2 subitem 2
desc 2 item 2

Equations

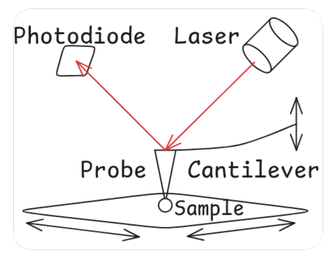
Here is an example of an equation

$$f_X(x|\mu,\sigma^2) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{\frac{1}{2\sigma^2}(x-\mu)^2\right\} \quad (1)$$

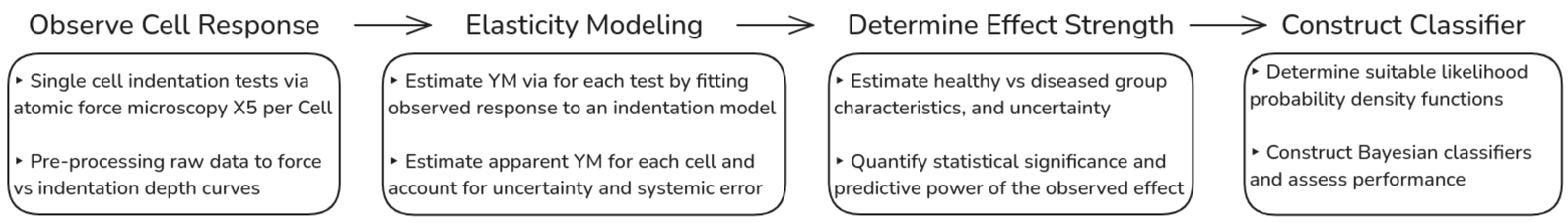
Introduction

This project investigates the predictive power of renal tubular epithelial cell stiffness as a biomarker for the progression of Diabetic Nephropathy (DN). DN is a common and serious complication of diabetes resulting in kidney failure due to progressive damage to the nephrons, the functional units of the kidney responsible for filtering the blood [@metcalfeW2007-HowDoesEarlyChronicKidneyDiseaseProgress]. This loss of function is due to physical changes at the cellular level induced by cytokine TGF-β 1 associated with an observable change in cytoskeleton stiffness [@hillsCE2012-TGFvModulatesCelltocell].

A force against indentation curve of a cells can be observed using Atomic Force Microscopy (AFM) where the deflection of a very fine probe on a flexible cantilever is measured to detect contact forces. From the spring constant of the cantilever the indentation and force exerted can be determined as the assembly is advanced into the sample. This curve can then be fitted against an elastic deformation model to determine an apparent Young's Modulus (YM).



Methodology



Figures and Tables

You cannot use floats in the baposter template. However, you can use figure captions by using `\captionof` instead of `\caption`. This is demonstrated in Fig. . Moreover, you can also use `\label` and `\ref` to make references to your figures and/or tables.

As you can see, the text background is not white. If your figures do not have a transparent background, this may look too ugly for you. You can of course change the background colour through the `boxColorOne` option. Alternatively, you can make the background transparent. In Matlab, the following example demonstrates how this is done

```
f1 = figure(1);
set(f1,'Color','none');
```

You can also use `pgfplots` [2] for plotting your Matlab data. This is not that hard and the resulting plots are much nicer than Matlab plots, so I will strongly recommend that you have a look at `pgfplots` right here `http://sourceforge.net/projects/pgfplots/`.

header 1	header 2	header 3
data (1,1)	data (1,2)	data (1,3)
data (2,1)	data (2,2)	data (2,3)
data (3,1)	data (3,2)	data (3,3)

Table 1: A very simple table with booktabs

Known Problems

- The math matrix environment `\begin{matrix} ... \end{matrix}` causes an error. I do not know why. Use the array environment until the problem is resolved.

Feedback

- This poster theme has been tested with baposter v. 2.0, and it can be downloaded from my website [3] or my personal website [4].
- If you find a bug in this theme (and not in the baposter template), please do not hesitate to contact me. There is a FAQ at the baposter website [1], if you should have any problems with it.

References

[1] Brian Amberg: *LaTeX Poster Template*, `http://www.brian-amberg.de/uni/poster/`

[2] Christian Feuersänger: *PGFPlots - A LaTeX Package to create normal/logarithmic plots in two and three dimensions*, `http://pgfplots.sourceforge.net/`

[3] NUST SEECS Namkeen Theme: *Official Beamer Theme, Poster Theme, and Report Template*, `https://github.com/hasanalikhattak/namkeen`

[4] Hasan ali khattak: *Associate Professor, NUST School of Electrical Engineering and Computer Science (NUST-SEECS)*, `https://hasan.khattak.info`