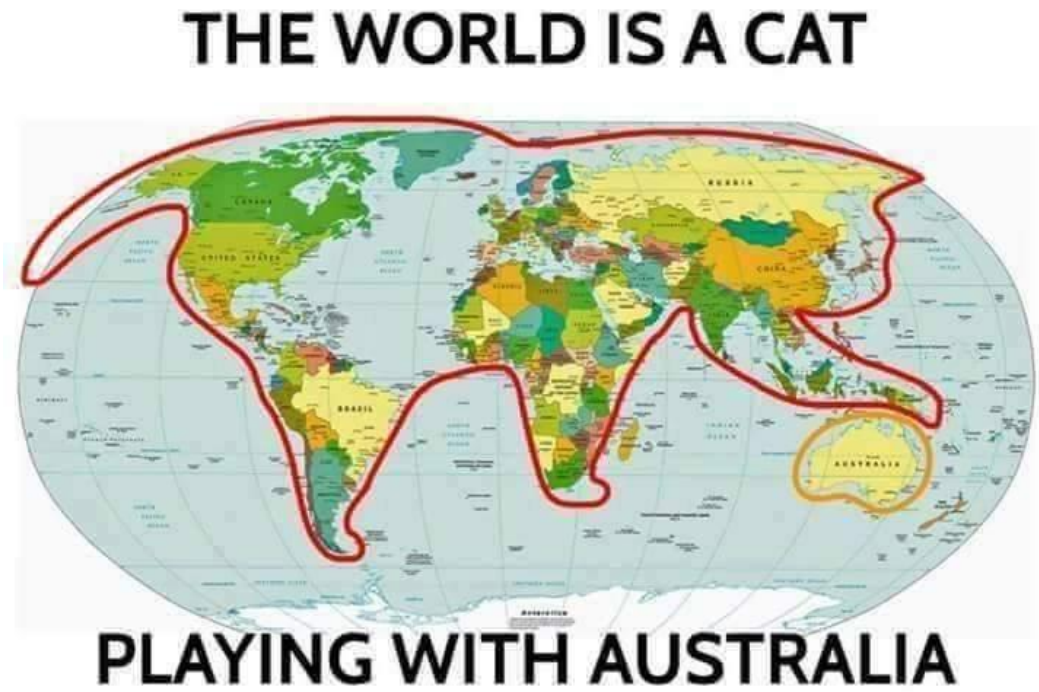

PP 275: Section 03

Simon Greenhill & Hikari Murayama
September 9, 2022

Agenda

1. Logistics
    a. Lab submissions
    b. Office hours today
2. Lab 0 and 1 review
3. Lecture Review - K-function
4. Jupyter Notebook

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Logistics: Office Hours

Will only have 30 minutes after section today

Logistics: Lab Submissions

- Make sure you re-run *all* of your cells in your notebooks prior to submission
- Please make sure to list the folks you've worked with
- Please also submit a PDF version of your labs

Side note: Start Lab 3 early if you haven't started already!

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Lab 0 Review: Problem 6

Write out $\overrightarrow{v} + \overrightarrow{r}'$.

Lab 0 Review: Problem 6

Write out $\vec{v} + \vec{r}'$.

Trick question! Remember our two vectors look like:

$\vec{v} = [50 \quad 63]$ $\quad \vec{r} = [1 \quad 2]$

Where $\vec{r}'$ looks like $\vec{r}' = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

We cannot add two vectors that don't have matching dimensions

Lab 0 Review: Problem 11

Write out the set $\tilde{S} = \{\mathbf{A}, [\vec{r}, \vec{v}]\}$.

Where $A = \begin{bmatrix} 1 & 50 \\ 2 & 63 \end{bmatrix}$ $\vec{v} = \begin{bmatrix} 50 & 63 \end{bmatrix}$ $\vec{r} = \begin{bmatrix} 1 & 2 \end{bmatrix}$

Lab 0 Review: Problem 11

Write out the set $\tilde{S} = \{\mathbf{A}, [\vec{r}, \vec{v}]\}$.

Where $A = \begin{bmatrix} 1 & 50 \\ 2 & 63 \end{bmatrix}$ $\vec{v} = \begin{bmatrix} 50 & 63 \end{bmatrix}$ $\vec{r} = \begin{bmatrix} 1 & 2 \end{bmatrix}$

$$\tilde{S} = \left\{ \begin{bmatrix} 1 & 50 \\ 2 & 63 \end{bmatrix}, \begin{bmatrix} 1 & 2 & 50 & 63 \end{bmatrix} \right\}$$

Lab 1 Review

- Make sure to read all instructions carefully!
- `np.hstack`
  - *Warm up exercise:* Suppose we have the following two arrays.

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 7 & 8 & 9 & 10 \\ 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 7 & 8 & 9 & 10 \end{bmatrix} \quad B = \begin{bmatrix} 10 & 11 & 12 \\ 13 & 14 & 15 \\ 10 & 11 & 12 \\ 13 & 14 & 15 \end{bmatrix}$$

  - Will these two work in np.hstack?
  - If not, could be manipulate them to work?

Lab 1 Review

```
np.hstack((D, C))
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
Input In [35], in <cell line: 1>()
----> 1 np.hstack((D, C))

File <__array_function__ internals>:5, in hstack(*args, **kwargs)

File ~/opt/anaconda3/lib/python3.9/site-packages/numpy/core/shape_base.py:345, in hstack(tup)
    343     return _nx.concatenate(arrs, 0)
    344 else:
--> 345     return _nx.concatenate(arrs, 1)

File <__array_function__ internals>:5, in concatenate(*args, **kwargs)

ValueError: all the input array dimensions for the concatenation axis must match exactly, but along dimension 0,
the array at index 0 has size 6 and the array at index 1 has size 3
```

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K-function

- What is it and what is its purpose?
- How do we calculate it?

K-function

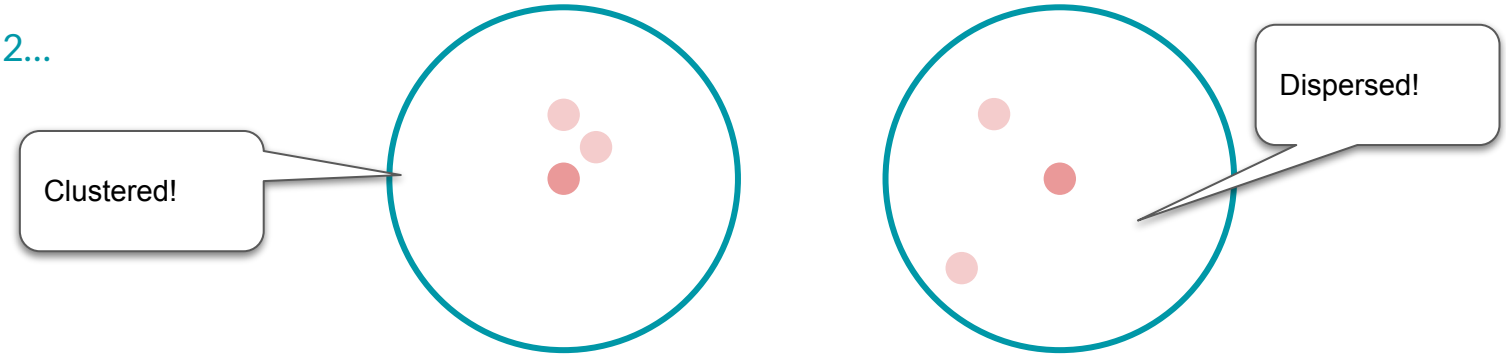
What is it and what is its purpose?

K-function helps us answer the question:

→ *How do events relate to each other?*

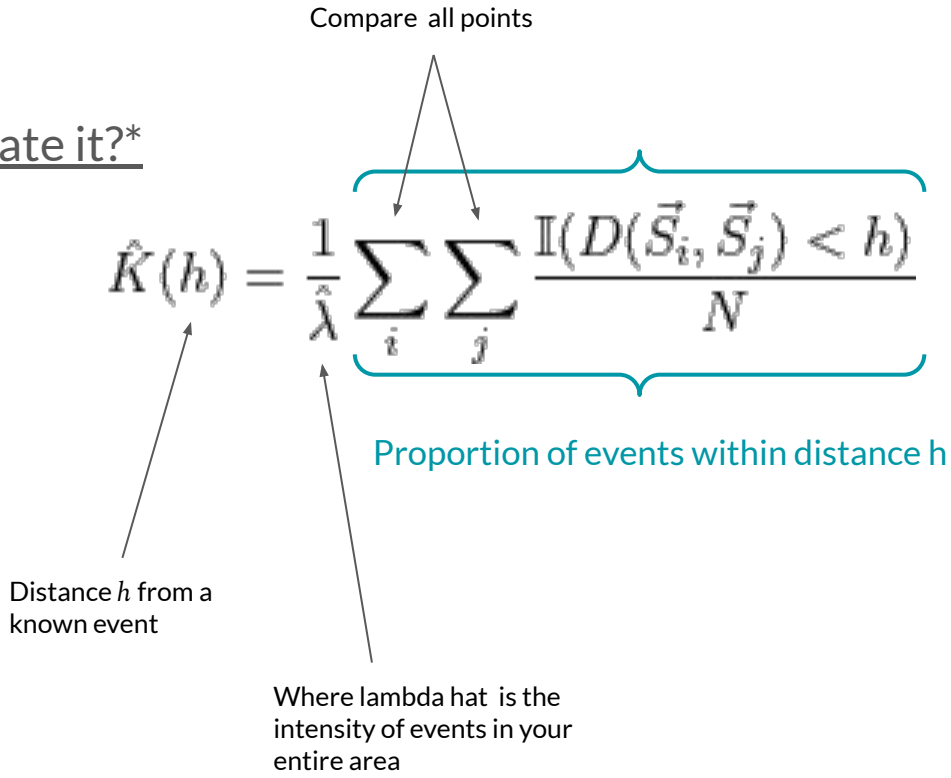
→ Second order effects: think clustering vs dispersion

For h=2…



K-function

How do we calculate it?*



*Note that notation in the lab is slightly different

K-function

How do we calculate it?*

Compare all points

$$\hat{K}(h) = \frac{1}{\hat{\lambda}} \sum_i \sum_j \frac{\mathbb{I}(D(\vec{S}_i, \vec{S}_j) < h)}{N}$$

Proportion of events within distance h

Distance *h* from a known event

Where lambda hat is the intensity of events in your entire area

We vary *h* to see how much clustering changes with varying distances from our points

*Note that notation in the lab is slightly different

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Jupyter Notebook

Download it from bcourses and follow along!

Office Hours now!
in Hearst Living Room