

NEAREST NEIGHBOR ANALYSIS

- **PRESENTATION BY**

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NEAREST NEIGHBOR ANALYSIS

- Nearest neighbor analysis is a statistical method used in geography and other related fields to measure the spatial distribution of a pattern.
- The pattern is measured by comparing the distance between each point and its nearest neighbor.
- It helps determine if the pattern is clustered, random, or uniformly spaced by calculating a nearest neighbor index (R_n).
- Nearest neighbor index (R_n) indicates the extent to which the observed distribution deviates from a perfect random distribution.

NEAREST NEIGHBOR ANALYSIS

- निकटतम पड़ोसी विश्लेषण (Nearest Neighbour Analysis) एक भौगोलिक या सांख्यिकीय विधि है जो अंतरिक्ष में किसी घटना या वस्तुओं के वितरण के पैटर्न को मापती है। यह एक संख्यात्मक मान प्रदान करता है जो बताता है कि बिंदु कितने समूहीकृत हैं या समान रूप से दूरी पर स्थित हैं, जिसका उपयोग किसी क्षेत्र में पैटर्न का वर्णन करने के लिए किया जाता है। इस विश्लेषण का उपयोग विभिन्न क्षेत्रों में किया जाता है, जैसे कि अस्पतालों, स्कूलों, या प्राकृतिक घटनाओं (जैसे कि बीमारियों का प्रसार) के वितरण पैटर्न को समझने के लिए। **डेटा:** यह विधि भौगोलिक स्थानों या विशेषताओं के "पॉइंट" डेटा के साथ काम करती है।
- **माप:** यह प्रत्येक बिंदु के लिए सबसे निकटतम पड़ोसी की दूरी मापता है।
- **गणना:** इन दूरियों के आधार पर एक "निकटतम पड़ोसी सूचकांक" (Nearest Neighbour Index) की गणना की जाती है।
- **व्याख्या:** सूचकांक का मान यह बताता है कि वितरण किस प्रकार का है:
 - **1.0:** यादृच्छिक (random) वितरण।
 - **1.0 से अधिक:** सम दूरस्थ वितरण (even distribution)।
 - **1.0 से कम:** समूहीकृत (clustered) वितरण।
 - **सूचकांक 2.5:** बस्तियों में अत्यधिक समूहीकृत वितरण दर्शाता है।
- **उदाहरण:** यह विश्लेषण करके यह निर्धारित किया जा सकता है कि किसी शहर में दुकानें कितनी दूर-दूर हैं या कोई बीमारी कैसे फैल रही है।
- **अनुप्रयोग :**
- **भौगोलिक अध्ययन:** किसी क्षेत्र में शहरीकरण, पेड़ों के वितरण, या अन्य प्राकृतिक या मानव-निर्मित विशेषताओं के पैटर्न का विश्लेषण करने के लिए।
- **शहरी योजना:** शहर के भीतर विभिन्न व्यवसायों या सुविधाओं (जैसे कि पार्क, स्कूल, अस्पताल) के वितरण का मूल्यांकन करने के लिए।
- **महामारी विज्ञान:** बीमारी के प्रकोप के पैटर्न को समझने के लिए, जैसा कि लंदन में हैजे के प्रकोप के उदाहरण में दिखाया गया है।
- **व्यवसाय विश्लेषण:** यह समझने के लिए कि किसी विशेष बाजार क्षेत्र में किसी उद्योग या व्यवसाय की उपस्थिति कितनी सघन या वितरित है।

NEAREST NEIGHBOR ANALYSIS

- **Measure distances:**
- Calculate the straight-line distance from each point to its closest neighbor within the same group.
- Calculate the mean observed distance ($\bar{D}_o$):
- Find the average of all these measured nearest neighbor distances.
- Calculate the expected mean distance ($\bar{D}_e$):
- Determine the average distance between points in a hypothetical perfect random distribution using the formula $\bar{D}_e = \frac{1}{2} \sqrt{\frac{A}{n}}$ where "Area" is the total area studied and "n" is the total number of points.
- Calculate the nearest neighbor index (R_n):
- Divide the observed mean distance by the expected mean distance: $R_n = \frac{\bar{D}_o}{\bar{D}_e}$
- $R_n = \frac{\bar{D}_o}{\bar{D}_e}$

NEAREST NEIGHBOR ANALYSIS

- Interpret the index (R_{ncap} $R_{sub\ n}$ R_n):
- R_{ncap} $R_{sub\ n}$
- $R_n = 0$: The pattern is perfectly clustered.
- $R_n = 1$: The pattern is random.
- $R_n = 2.15$: The pattern is perfectly uniform.

NEAREST NEIGHBOR ANALYSIS

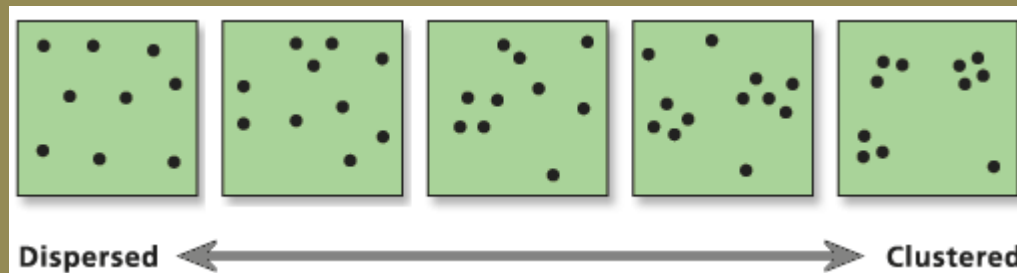
- Applications
- **Urban and human geography:**
- Analyzing the distribution of businesses, housing, or other land uses within a city.
- **Ecology:**
- Studying patterns of plant or animal distribution to understand competition or resource availability.
- **Other fields:**
- Can be used in any area with spatially distributed data, such as geology or the study of seismic activity.

NEAREST NEIGHBOR ANALYSIS

- **Nearest Neighbour Analysis** measures the spread or distribution of something over a geographical space. It provides a numerical value that describes the extent to which a set of points are clustered or uniformly spaced.
- **Why would we use nearest neighbour analysis?**
- Researchers use nearest neighbour analysis to determine whether the frequency with which something is observed spatially is comparable with other locations. It can provide researchers with a numerical value for the 'clustering' of a geographical phenomenon, allowing this value to be compared more accurately with other places.
- **Worked Example:**
- In this example, researchers have mapped the land use of each building in a 200m by 200m plot in a town centre, using a Goad map. A Goad map is a detailed street map that shows individual buildings and their plots, and is usually needed for land registry and insurance purposes. They can be purchased through online sources. The nearest neighbour analysis can be used to identify whether there are clustered land use zones within that section of the town.

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- If the index (average nearest neighbor ratio) is less than 1, the pattern exhibits clustering.
- If the index is greater than 1, the trend is toward dispersion.



NEAREST NEIGHBOR ANALYSIS

- The Average Nearest Neighbor tool returns five values: Observed Mean Distance, Expected Mean Distance, Nearest Neighbor Index, z-score, and p-value.

NEAREST NEIGHBOR ANALYSIS

Q- You are given an outline map of Bihar on which (all cities with a population more than one lakh person are located) all districts headquarters are located. Calculate the nearest Neighbour statistics and write a short notes analysing the result. The area of the state of Bihar is 1,73,276 sq. km.

Ans. I have assumed that 1 cm = 25 kms. 1000

Nearest Neighbour	Scale distance	Actual distance
1 → 2	2.3	57.5
2 → 1	2.3	57.5
3 → 4	1.5	37.5
4 → 3	1.5	37.5
5 → 22	1.0	25.0
23 → 5	1.0	25.0
6 → 22	1.0	25.0
22 → 6	1.0	25.0
7 → 10	2.2	55.0
10 → 9	1.1	27.5
9 → 10	1.1	27.5
8 → 10	2.3	57.5
11 → 10	2.0	50.0
12 → 17	1.4	35.0
17 → 13	2.2	55.0
13 → 17	2.2	55.0
14 → 15	2.7	67.5
15 → 14	1.7	42.5
16 → 17	2.4	60.0
17 → 16	3.0	75.0
18 → 19	2.2	55.0
19 → 28	2.2	55.0
28 → 19	1.5	37.5
20 → 21	1.5	37.5
21 → 20	1.0	25.0
24 → 25	1.0	25.0
25 → 24	2.7	67.5
26 → 25		

NEAREST NEIGHBOR ANALYSIS

N.N.

27-230
30-227
29-225
31-230

Scale distance

3.1
3.1
3.4
3.7

Actual distance

77.5
77.5
85.0
98.5
154.0

$$\sigma = \frac{\sigma_0}{\sigma_E}$$

$$\sigma_0 = \frac{\text{Actual dist.}}{N \cdot \text{number}} = \frac{154.0}{31}$$

$$\sigma_0 = 4.9677$$

$$\sigma_E = \frac{1}{2\sqrt{p}}$$

$$\sigma_E = \frac{1}{2\sqrt{\frac{1}{31}}}$$

$$\sigma_E = \frac{1}{2 \times \sqrt{0.001732}}$$

$$\sigma_E = \frac{1}{2 \times 0.01335} = \frac{1}{0.02670}$$

$$\sigma_E = 37.453$$

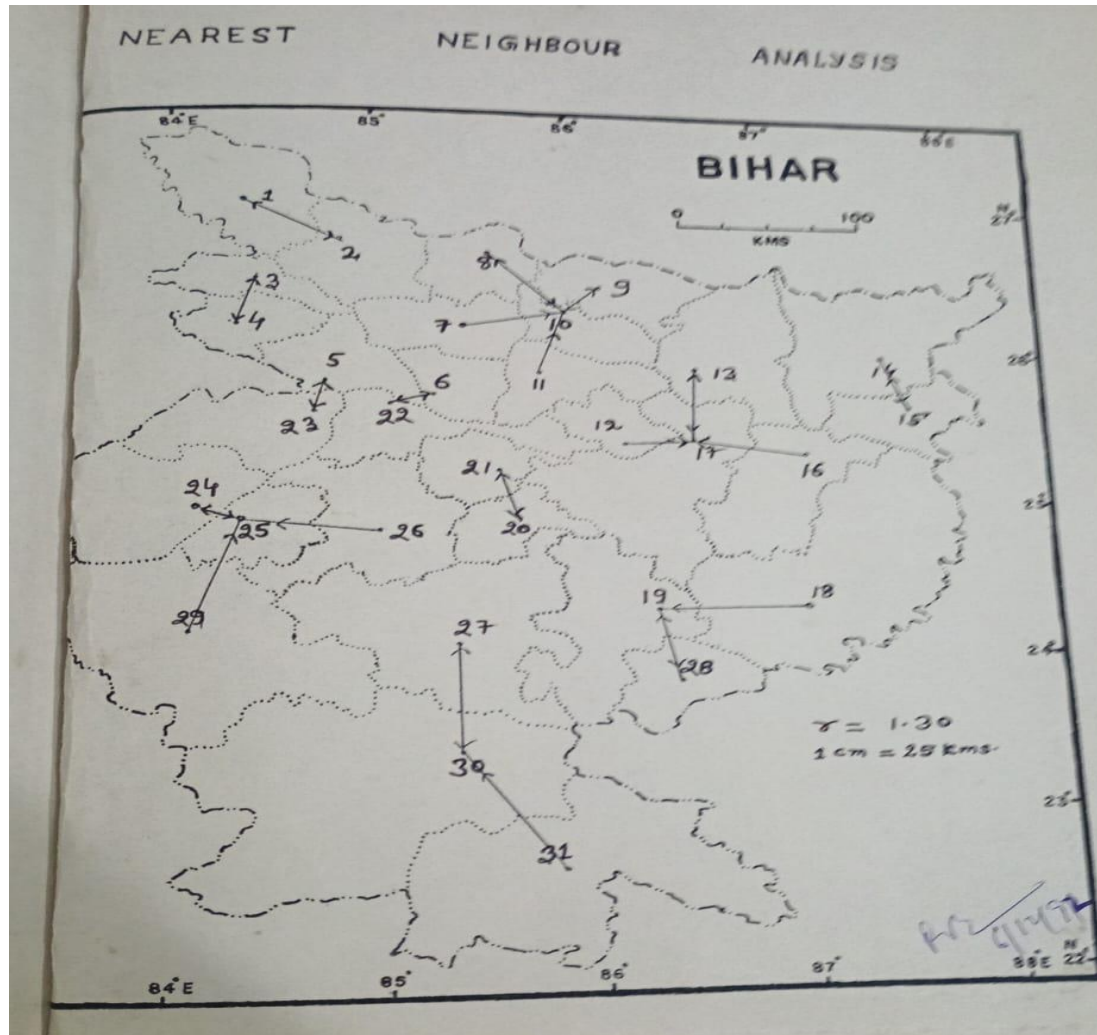
$$\therefore \sigma = \frac{\sigma_0}{\sigma_E}$$

$$\sigma = \frac{4.9677}{37.453}$$

$$= 1.2953 \approx 1.30$$

$$\therefore \sigma = 1.30$$

NEAREST NEIGHBOR ANALYSIS



NEAREST NEIGHBOR ANALYSIS

- **THE END**

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THANK YOU



- **HAVE A NICE DAY.**