Catalyst conversation on AI

IIT ROPAR - Minor in AI

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Case Study: Rolling a Dice

Figure 1: Dice rolls

Random Number Experiment

Let us imagine a class activity where students roll a dice 100 times each. After completing their rolls, they record the numbers and calculate the average. One student might roll these numbers: 2, 4, 6, 3, 5, and so on. Adding them up gives a total, for example, $2 + 4 + 6 + 3 + 5 + \cdots = 350$. Dividing this total by 100 rolls, the average is $350 \div 100 = 3.5$. Interestingly, when other students complete the same activity, their averages also come very close to 3.5.

The teacher repeats this experiment multiple times and finds that the average remains consistent around 3.5. This observation raises the question: why does this happen?

Why does the average come out to 3.5?

Let us take an example. If you roll a dice a few times, you might get numbers like 1, 4, 6, 3, and 5. Adding these numbers gives you $1 + 4 + 6 + 3 + 5 = 19$. Now divide this sum by the number of rolls, which is 5. The average becomes $19 \div 5 = 3.8$. The next time you roll the dice, you might get different numbers like 2, 3, 5, 6, and 4. This time, the total is $2 + 3 + 5 + 6 + 4 = 20$, and the average is $20 \div 5 = 4.0$. If you keep repeating this process, you will see the averages getting closer and closer to 3.5.

What is special about 3.5?

The number 3.5 is interesting because it is exactly halfway between the smallest number (1) and the largest number (6). For example, if you add all the numbers from 1 to 6, you get $1 + 2 + 3 + 4 + 5 + 6 = 21$. Divide this by 6 (the total number of numbers), and you get $21 \div 6 = 3.5$. This is why 3.5 keeps appearing as the average when you roll a dice many times.

Real-Life Connection

Think of a situation where you distribute candies to children. If each child gets between 1 and 6 candies, and you do this for a large group of children, on average, each child will get around 3 or 4 candies. This shows how averages work in everyday scenarios.

Heat Map from Pin Code Data

A survey was conducted with 500 students, and their pin codes were collected. These pin codes were used to find their locations. These locations were then marked on a map. The result was a type of map called a heat map.

What is a heat map?

A heat map is a visual way to show how concentrated something is in different areas. For example, if many students come from one specific area, that part of the map will appear bright or intense in color. If fewer

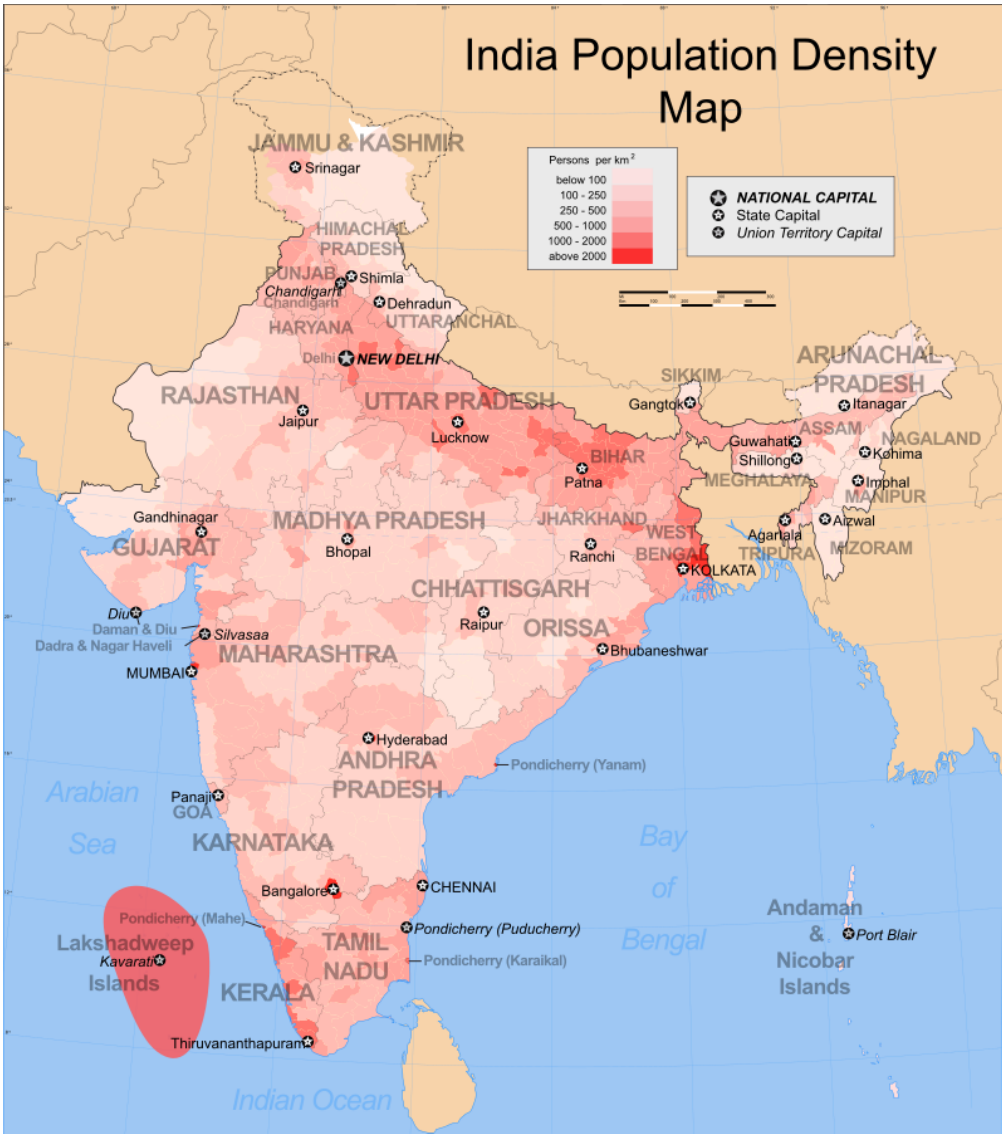

Figure 2: Example of a Heat Map showing population density in different areas.

students come from another area, it will appear lighter or less intense.

Example of a Heat Map

Imagine you are marking the houses of 500 students on a city map. If 100 students live in one neighborhood, that area will look very bright on the heat map. If only 5 students live in another neighborhood, that part of the map will look faint. This way, the heat map makes it easy to understand where most students are located.

Properties of the Heat Map

- **High concentration areas**: Bright or intense colors show where most students are located.

- **Low concentration areas**: Light or faint colors show where fewer students are located.
- **Clear distribution**: It provides a clear visual of how students are spread across different locations.

Real-Life Uses of Heat Maps

Heat maps are not just for students. They are used in many fields. For example:

- **Traffic Analysis**: To show where traffic jams happen most often.
- **Weather Reports**: To display temperature or rainfall in different areas.
- **Business Planning**: To identify where most customers are located.

This helps people make better decisions based on the data.