Week 05 Homework
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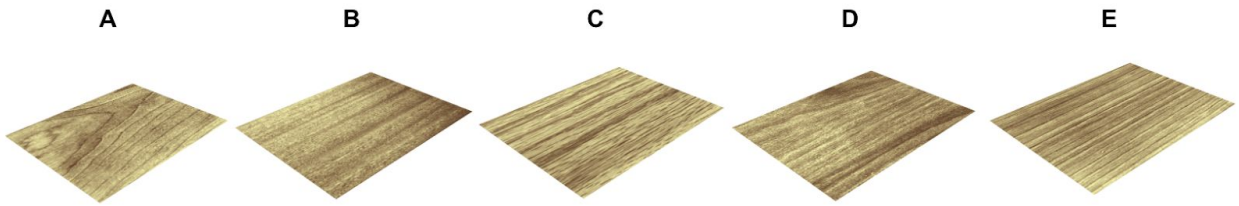
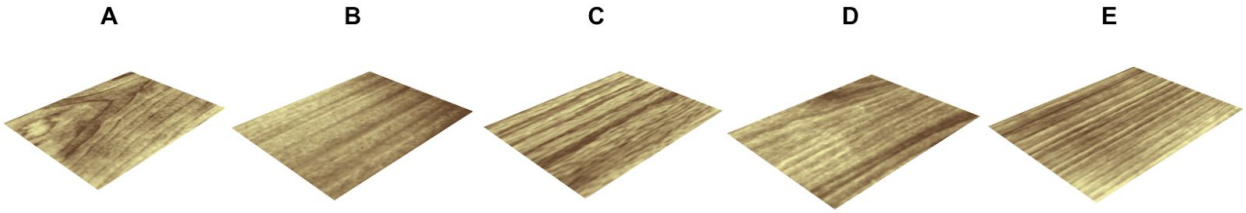
Question - Given five images of wood, the goal is to find which two of the images depict the same type of wood.
Solution - From the pictures, we may identify wood by its grain, which is characterized by (1) the texture and (2) orientation of tree ring patterns.

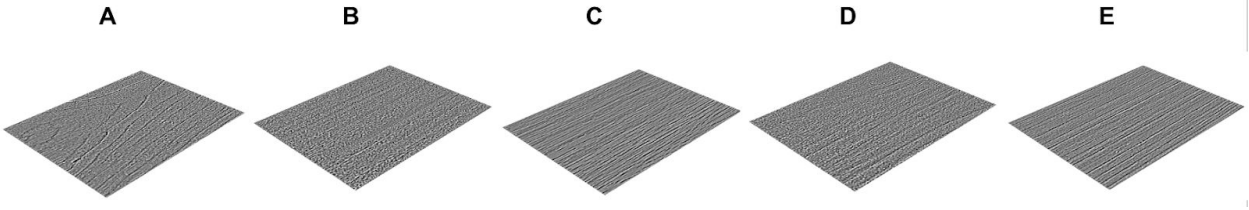


1. Texture: rough/smooth:

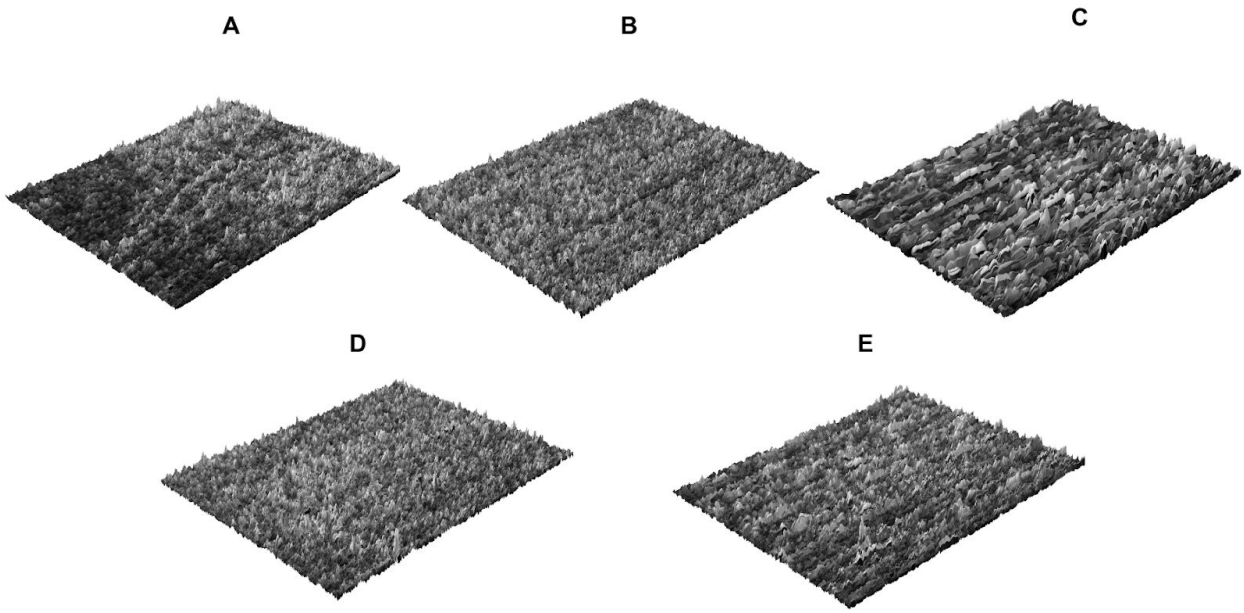
- Calculate Index for Elevation Deviation
  - *Calculate Mean for original layer for **10 iterations** → Focal statistics*
    - Purpose: Smoothen the surface



  - *Calculate the difference between elevations in Original layer and the smoothened layer → Raster calculator*
    - Purpose: Derive a map of deviations for each pixel from the general trend of spreading

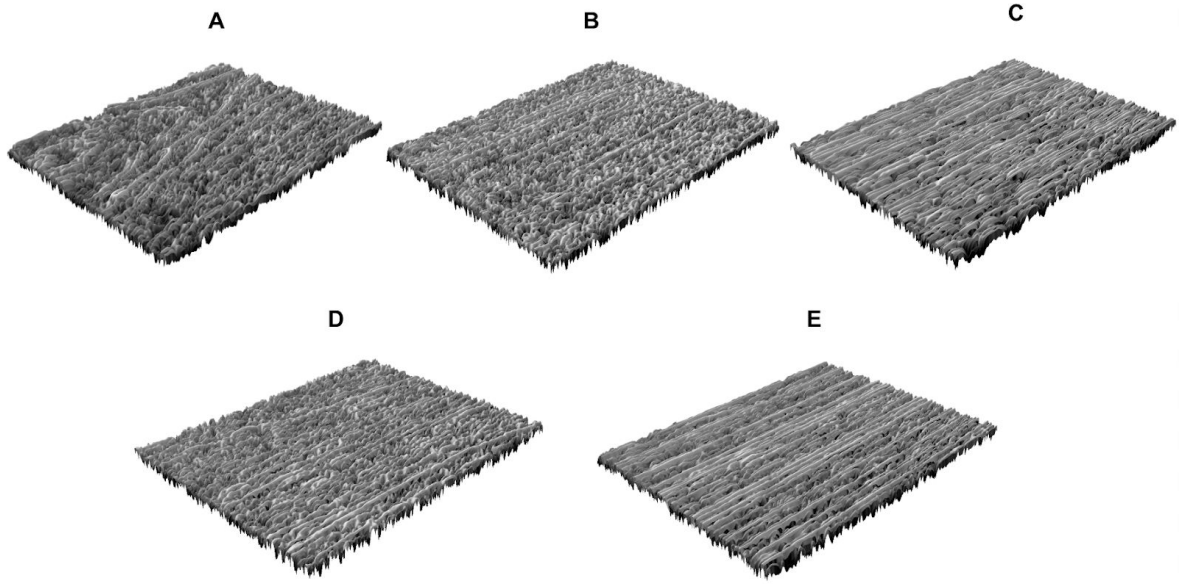


- *Calculate the range of elevation deviations within 3x3 neighborhood → Focal Statistics*
    - Purpose: Calculate the range of variety in elevation deviation within each pixel's immediate vicinity

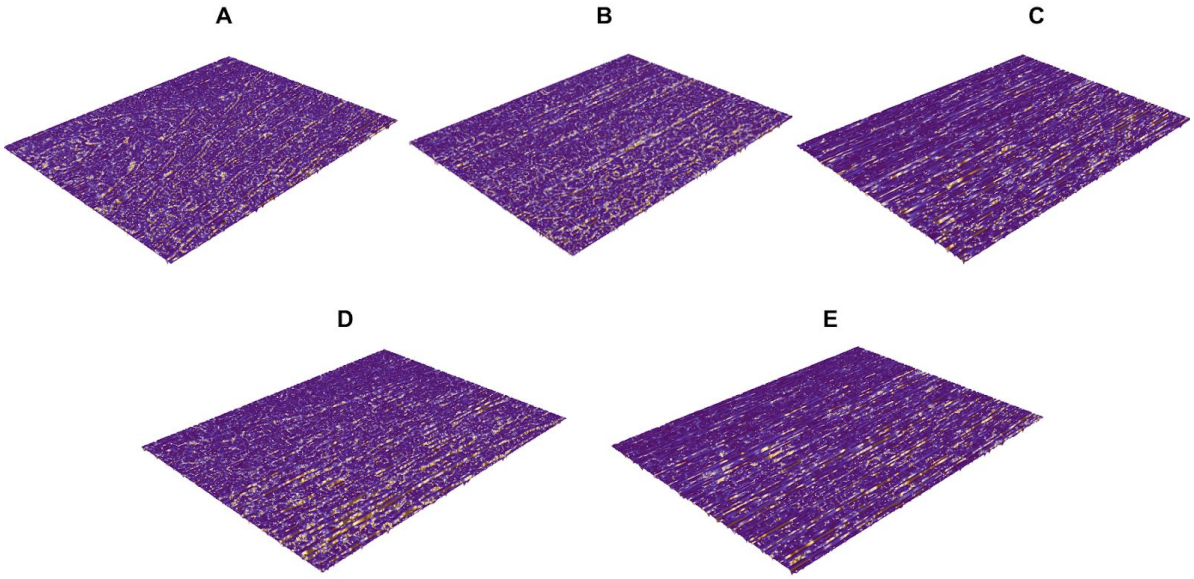


- *Calculate the majority number of the range of elevation deviation → 1. Raster calculator - Int(developed layer), 2. Zonal statistics - calculate the majority value*
    - Purpose: find the majority value in order to quantify the difference between each wood sample image
- Result: A: 4, B: 7, C: 4, D:7, E: 7

- Calculate Index for Slope Deviation
    - *Calculate Slope of smoothened layer → Spatial Analyst Tools > Surface > Slope*
    - *Calculate the majority number of slope → 1. Raster calculator - Int(developed layer), 2. Zonal statistics - calculate the majority value*



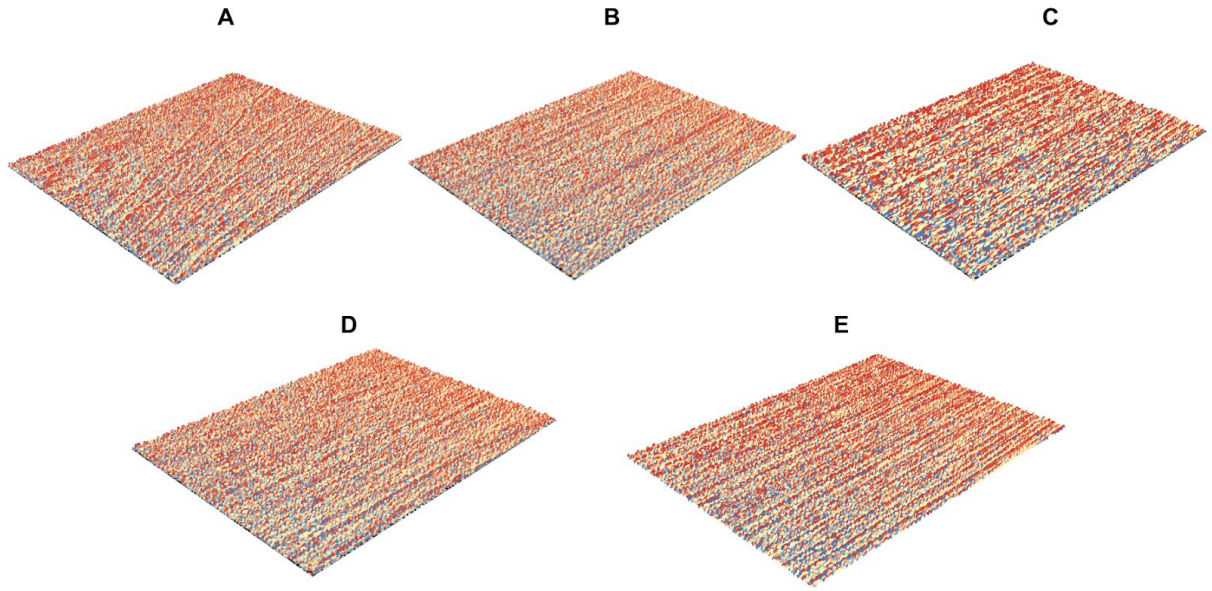
- Result: A: 58, B:72, C: 79, D: 70, E:78
- *Calculate the slope of slope*
    - *Purpose: Make a map that represent low-to-high slope values with low-to-high positions*



- Result: A: 87, B: 87, C: 88, D:87, E:88

2. Orientation of tree ring patterns:

- Calculate Index for Degree of Aspect
    - *Calculate Aspect → Spatial Analyst Tools > Surface > Aspect*
    - *Calculate the majority number of aspect → 1. Raster calculator - Int(developed layer), 2. Zonal statistics - calculate the majority value*
    - A: 353, B: 183, C:180, D:180, E:180



Combining the indices, B and D are assumed to be from the same tree species.

	A	B	C	D	E
Index for Range of Elevation Deviation	4	7	4	7	7
Index for Slope Deviation	58	72	79	70	78
Index for Slope x Slope Deviation	87	87	88	87	88
Index for Aspect	353	183	180	180	180