

Our Mathematical Senses

The Geometry Vision

Prof. Vijay Ravikumar

Department of Mathematics

Indian Institute of Technology- Madras

Lecture-26

Video 6B: Desargues's theorem in three dimensions

So I want to now return to Desargues theorem and I want to ask the question, what is the extended Euclidean space we've just defined? What does it actually have to do with Desargues theorem? Here's the image we had to define Desargues theorem, to explore it in the first place. And remember, the statement of Desargues theorem is all about triangles in the extended plane P^2 . It states that they're in perspective from a point, if and only if they're in perspective from a line. So it's a statement about triangles in P^2 , but as you may have guessed from the fact that the image looks oddly three-dimensional, it also holds for triangles in P^3 . If we just change this two to a three, we still get a true statement. And remarkably, well, yeah, this image can just as well represent a perspective view of triangles living in 3D space.

And remarkably, this version is actually much easier to prove. This 3D version is much easier to prove than the purely 2D version. So let's do it. Let's try and prove it and then prove the 2D version as a consequence.