Rishov Mondal.

1) "The occurrence of inconsistent equations is annoying as we would like to treat all matrices of rank r on equal footing.". Could you please elaborate.

2) What is the motivation behind trying to understand a system of inconsistent equation by introducing Projective Space?. Are we trying to overcome the limitations of the existing space this way?

3) "In order to study linear geometry, it is convenient to work with projective spaces so that rank is the only thing that determines consistence." Could you please elaborate.

Deal with many corner cases

~~Always~~ special cases will exists.

Try to reduce them

Homogeneous $\iff$ all points are similar

Euclidean geometry.

Parallel $\overset{vs}{\longleftrightarrow}$ Intersecting lines

xy Pair of lines

Double line

Conics $\to$ Circle

Ellipse Hyperbola Parabola

x^2

Same.

Cartesian in a plane.

Empty Scheme $= \mathbb{P}(0)$.

r

Projective geometry.

Coplanar lines always meet,

If and only if.

Barnali Jana

What is the definition of Locus of solutions in an affine space ?

Ramanujan Srihari

I think it is just the set of points in the affine space that satisfy a system of polynomial equations. (In general 'locus' means a set of points in some space that are determined by certain constraints. For example, the locus of points in R^2 that have a fixed positive distance from a chosen point is a circle.)

$$\boxed{X^2 + Y^2 = 1} \qquad (X, Y) \in \mathbb{R}^2$$

$(X, Y) \in \mathbb{Q}^2$ $\quad$ $(X, Y) \in \mathbb{F}_2^2$ $\quad$ "Figure"

$\left(\frac{3}{5}, \frac{4}{5}\right)$ $\quad$ $(1, 0)$ $\quad$ $(x, y) \in \mathbb{F}_5^2$

"Locus" $\longleftrightarrow$ some geometric shape which has the property of "all" solutions $\longrightarrow$ Russell's paradox

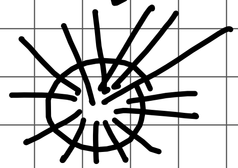
$\boxed{X^2 + Y^2 = 1}$ (X, Y) are contractible numbers. $\downarrow$ ($\mathbb{R}$ & $\mathbb{C}$)

$\mathbb{F}_5$: $X^2 + Y^2 = 1.$ $\quad 5 = 0$ $\quad$ $\mathbb{F}_5$-algebras.

Remark:- To make projective space we "shrink" a line to a point. What about shrinking other things?

$|x^2+y^2=1|$ we could think of the circle as parametrizing angles.

"Shrinking a "ray" to a point"



[Make a space which parametrizes some shapes/configurations/figures.

Is there a space that parametrizes planes in $\mathbb{P}$ N dimensional vector space.

N=3

Space parametrizing planes $\subset V$ (3-dim.)

$\updownarrow$

Perpendicular

$\boxed{f(v)=0}$ $f \in V^* \setminus \{0\}$.

N=4 planes in V - 4-dim vector space.

$\boxed{\text{Grassmann.}}$ $G_r(p,N)$ $0<p<N$

Plucker coord.

$|$Moduli$|$

$\uparrow$

$G(p,N)$

$\subset \mathbb{P}^M$

P dim'l subspace W of N-dim'l space V is given by a "projection"

$W \to V \xrightarrow{\pi} W \hookrightarrow V$ $\pi^2=\pi$ | $\boxed{\mathrm{Tr}\,\pi = \dim}$

Idempotent matrices. $|x^2=x|$