

Fibrations by singular curves on unirational surfaces

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In 1944 Zariski discovered that Bertini's theorem on variable singular points is no longer true when we pass from a field of characteristic zero to a field of positive characteristic. In other words, he found fibrations by singular curves, which only exist in positive characteristic. Such fibrations were important to the extension of Enriques' classification of surfaces to positive characteristic, due to Bombieri and Mumford in 1976. Moreover, such fibrations are also related with other pathological phenomena. For instance, Mukai in 2013 and Zheng in 2016 discovered that they are connected with counterexamples of Kodaira vanishing theorem and, in a jointly work with Hefez and Rodrigues in 2019, they were related with isolated singularities with infinity Milnor number. In this talk we are going to present an overview about possibilities to approach the classification of such phenomenon and we will use quotient by vector fields or foliations to attack this problem when the total space is a unirational surface. This is a work in progress with J. H. O. Rodrigues and R. O. C. Santos.