(1) **Husniyah Alzubaidi,** University of Edinburgh, UK.

Octahedral and higher triangulated We study higher triangulations by modifying the axioms of triangulated categories. These are used to show that the heart of a torsion theory given by Fourier-Mukai transforms on abelian surfaces X by tilting $\mathrm{Coh}(X)$, is isomorphic to the heart of a t-structure given by Bridgeland stability. The motivation of the work is to show that we can link the slope stability with the weak index theorems building on earlier work of Jason Lo and to illustrate how to apply higher octahedra to simplify the computations.

(2) **Ali Bajravani** Tabriz, Iran. ON-LINE ONLY

Martens Type Theorems for Higher Rank Brill–Noether Loci We discuss a couple of Martens type theorems for some higher rank Brill–Noether loci.

(3) **Edgar Castañeda González**, Guanajuato, Mexico ON-LINE ONLY

Higgs Coherent Systems over a Curve Let X be a smooth complex projective curve of genus $g \geq 2$. A Higgs coherent system over X is an augmented bundle (E, V), where V is a subspace of the twisted endomorphisms of E. The moduli functor of these objects has an associated GIT problem. Therefore, using GIT methods it is possible to construct a moduli space of Higgs coherent systems of fixed type. In this poster, we describe the moduli functor of Higgs coherent systems and its GIT version. The construction of the GIT-quotient is a work in progress joint with Leticia Brambila-Paz.

(4) **George Cooper,** University of Oxford, UK.

GIT Constructions of Compactified Universal Jacobians over $\overline{\mathcal{M}}_{g,n}$ and $\overline{\mathcal{M}}_{g,n}(X, \beta)$. Modular compactifications of the stack of slope-semistable vector bundles over the stack $\overline{\mathcal{M}}_{g,n}(X, \beta)$ are described, consisting of torsion-free sheaves satisfying the multi-Gieseker semistability condition of Greb-Ross-Toma with respect to a choice of n relatively-ample invertible sheaves on the universal curve over $\overline{\mathcal{M}}_{g,n}(X, \beta)$ and a non-zero vector $\sigma \in (\mathbb{Q}^{>0})^n$. These stacks admit explicit quotient presentations and projective good moduli spaces, which can all be described as GIT quotients of projective varieties, with the variety depending only on the choice of relatively-ample invertible sheaves and not on σ. For generic choices of stability conditions these stacks are proper, Deligne-Mumford, and admit natural virtual fundamental classes. As a special case, this yields a new construction of the universal Picard variety $\overline{P_{g,d}}$ of Caporaso and Pandharipande.

(5) **Jyoti Dasgupta**, Indian Institute of Science, Pune.

Seshadri constants of equivariant vector bundles on toric varieties Seshadri constants measure the local positivity of an ample line bundle. They were introduced by Demailly. Later, Hacon

generalized the notion of Seshadri constants to vector bundles. We consider torus equivariant vector bundles on toric varieties. Assuming certain conditions on the vector bundle, we compute precise values of Seshadri constants at arbitrary points on projective spaces and Bott towers of height at most 3. This is based on joint work with Bivas Khan and Aditya Subramaniam.

(6) **Andres Fernandez Herrero**, Cornell University, USA.

Harder-Narasimhan stratifications, Verlinde formulas and gauged Gromov-Witten invariants. Let C be a smooth projective curve, G a reductive group, and X an affine smooth variety equipped with an action of G. The moduli stack $Map(C, X/G)$ parametrizes pairs (E, s), where E is a G-bundle on C and s is a section of the associated fiber bundle $E(X)$ over C. Many moduli spaces of interest arise from equipping this stack with a stability condition. We would like to explain work in progress joint with Eduardo Gonzalez and Daniel Halpern-Leistner where we use a compactification of $Map(C, X/G)$ via Kontsevich stable maps (known as the moduli stack of gauged maps) in order to equip $Map(C, X/G)$ with a Harder-Narasimhan stratification (each pair admits a canonical parabolic reduction compatible with the extra data of the section). As an application, we provide formulas for the indexes of certain tautological K-theory classes on the semistable locus.

(7) **Richard Haburcak**, Dartmouth College, USA.

Maximal Brill–Noether Loci via K3 Surfaces The Brill–Noether loci $\mathcal{M}^r_{g,d}$ parameterize curves of genus g admitting a linear system of rank r and degree d; when the Brill–Noether number is negative, they sit as proper subvarieties of the moduli space of genus g curves. We explain a strategy for distinguishing Brill–Noether loci by studying the lifting of linear systems on curves in polarized K3 surfaces, which motivates a conjecture identifying the maximal Brill–Noether loci. Via an analysis of the stability of Lazarsfeld–Mukai bundles, we obtain new lifting results for line bundles of type g^3_d which suffice to prove the maximal Brill–Noether loci conjecture in genus 9–19, 22, and 23.

(8) **Andrés Ibáñez Núñez**, University of Oxford, UK.

The HKKP filtration in GIT. Haiden-Katzarkov-Konsevich-Pandit have defined a canonical filtration (the HKKP filtration) for any semistable quiver representation that describes the asymptotics of a natural gradient flow on its space of hermitian metrics. Roughly speaking, the HKKP filtration measures how far is a semistable representation from being polystable. Moduli-theoretically, this filtration defines a stratification of the semistable locus in the moduli of quiver representations. We show how an analogue of the HKKP filtration can be defined for general GIT set-ups, and how it is related to gradient flows and Kirwan blow-ups.

(9) **Minyoung Jeon**, University of Georgia, USA. ON-LINE ONLY.

Euler characteristics of Prym-Brill-Noether loci Prym varieties, named after Friedrich Prym, are abelian varieties constructed from étale double covers of algebraic curves. In 1985, Welters subsequently equipped Prym varieties with Brill-Noether loci. In this poster, we give a formula for the Euler characteristic of the Brill-Noether locus in Prym varieties with a vanishing sequence at one marked point, as an analogous result to Anderson-Chen-Tarasca who recently computed the Euler characteristic of the Brill-Noether locus of linear series with special vanishing at up to two marked point. This project is work in progress.

(10) **Bivas Khan**, University of Warwick, UK.

Classification and reduction of toric principal bundles Let X be a complex toric variety equipped with the action of an algebraic torus T, and let G be a complex linear algebraic group. We classify all T-equivariant principal G-bundles $\mathcal{E}$ over X and the morphisms between them. When G is connected and reductive, we characterize the equivariant automorphism group $\mathrm{Aut}_T(\mathcal{E})$ of $\mathcal{E}$ as the intersection of certain parabolic subgroups of G that arise naturally from the T-action on $\mathcal{E}$. We then give a criterion for the equivariant reduction of the structure group of $\mathcal{E}$ to a Levi subgroup of G in terms of $\mathrm{Aut}_T(\mathcal{E})$. We use it to prove a principal bundle analogue of Kaneyama's theorem on equivariant splitting of torus equivariant vector bundles of small rank over a projective space. This is based on joint work with Indranil Biswas, Jyoti Dasgupta, Arijit Dey and Mainak Poddar.

(11) **Xun Lin**, Tsinghua University, China. ON-LINE ONLY.

Indecomposibility of the Bounded derived categories of Brill-Noether varieties We prove that the bounded derived category of coherent sheaves of the Brill-Noether variety $G^r_d(C)$ that parametrizing linear series of degree d and dimension r on a general smooth projective curve C is indecomposable when $d \leq g(C) - 1$.

(12) **Yeqin Liu** University of Illinois at Chicago, USA, ON-LINE ONLY.

Higher Rank Brill-Noether theory on $\mathbb{P}^2$ In this poster I will exhibit (non)emptiness and (ir)reducibility results of Brill-Noether loci in the moduli space of stable sheaves on $\mathbb{P}^2$. For the first part, I will introduce an upper bound and a lower bound on the maximal possible h^0 of a stable sheaf in terms of its given Chern character, and point out the range where the bounds are sharp. For the second part, I will introduce a large collection of both irreducible and reducible Brill-Noether loci, and we shall see that in some sense "most" Chern characters have reducible Brill-Noether loci. This poster is based on joint work with Benjamin Gould and Woohyung Lee.

(13) **Erick David Luna Nuñez**, Morelia, Mexico

Bridgeland stability and classic algebraic geometry We will see the definition of Bridgeland stability conditions, we will discuss

some uses and compare it with classical techniques to prove a few classical results.

(14) **Martin Perez**, Freie Universität Berlin, Germany.

An overview of the construction of moduli spaces, from coherent sheaves to principal bundles. In the construction of moduli spaces two very important tools come up frequently, namely a strategy sometimes called Langton's algorithm to prove the properness of the moduli functor and GIT adjacent methods to show the existence of the moduli spaces. We will shortly review the important theorems underlying both of these tools in the case of the moduli space of vector bundles over a curve X. More precisely, we will show that Langton's algorithm in this case is just the valuative criterion of properness of the moduli functor that associates to each parameter space S the set of isomorphism classes of families of vector bundles over SxX. Additionally, we will see how the existence of Quot schemes provides the perfect environment to develop notions of stability and a corresponding GIT quotient. Lastly we will tackle which technical problems arise when trying to generalize the previous question first to higher dimensional projective varieties X, then when trying to generalize to principal G-bundles. Here we will talk about how Langton's algorithm is applied to the higher dimensional case and how it can be modified to the G-principal case. In doing this it will become apparent how torsion free sheaves and their generalization known as singular principal G-bundles are necessary to have projective moduli spaces.

(15) **Victor do Valle Pretti**, Université de Bourgogne, France.

Title: Determinants, even instantons and Bridgeland stability. The moduli of instantons bundles over a Fano threefold have been under investigation by many authors during the last 50 years. Their relation with exceptional collections and monads is already proven to be useful in many situations, such as the ADHM equations and D.Faenzi's work, for example. We will present how to prove they're stable in the sense of Bridgeland and obtain their moduli space as an open subset of the moduli of Bridgeland stable objects. This is done by finding a region where Bridgeland and quiver stability coincide, hence also obtaining general information about these moduli spaces. The general theory behind this association was proven by E.Macrì, here we provide a systematic way of describing the quiver regions for any smooth projective variety, if they exist. With this in hand, we can prove that instantons are stable in the sense of Bridgeland and describe them as a subvariety of a quiver moduli space.

(16) **Leonardo Roa-Leguizamón**, Los Andes, Colombia, ON-LINE ONLY

On the Segre Invariant for Rank Two Vector Bundles on $\mathbb{P}^2$. We extend the concept of the Segre Invariant for vector bundles on a curve to vector bundles on a surface X. For a vector bundle

E of rank 2 on X, the Segre invariant is defined as the minimum of the differences between the slope of E and the slope of all line subbundles of E. This invariant defines a semicontinuous function on the families of vector bundles on X. Thus, the Segre invariant gives a stratification of the moduli space $M_{X,H}(2; c_1, c_2)$ of H-stable vector bundles of rank 2 and fixed Chern classes c_1 and c_2 on the surface X into locally closed subvarieties $M_{X,H}(2; c_1, c_2; s)$ according to the value of s. For $X = \mathbb{P}^2$ we determine what numbers can appear as the Segre Invariant of a rank 2 vector bundle with given Chern's classes. The irreducibility of strata with fixed Segre invariant is proved and its dimensions are computed. Finally, we present applications to the Brill-Noether Theory for rank 2 vector bundles on $\mathbb{P}^2$. This is a Joint work with H. Torres-López and A.G. Zamora (Universidad Autónoma de Zacatecas, Mexico) DOI:10.1515/advgeom-2021-0003.

(17) **Praveen Kumar Roy**, Sami Shamoon, Israel, ON-LINE ONLY.

On the Rationality of moduli spaces of vector bundles over chain-like curves. Let C be a smooth projective curve and let $\mathcal{U}_C(r, d)$ denote the moduli space of semistable vector bundles of rank r and degree d. Let $\det : \mathcal{U}_C(r, d) \to \mathcal{U}_C(1, d)$ denote the canonical determinant map defined by $\det([E]) = [\Lambda^r E]$. The fibre of this map over an element $L \in \mathcal{U}_C(1, d)$ is denoted by $\mathcal{SU}_C(r, L)$. In 1966, Tjurin first proved that the moduli space $\mathcal{SU}_C(2, L)$ is a rational variety, for any line bundle L on C of odd degree. Subsequently in 1975, Newstead generalised the result of Tjurin and proved that $\mathcal{SU}_C(r, L)$ is a rational variety provided $(r, d) = 1$ and some other conditions hold. After a couple of decades, it was proved by King and Schofield that $\mathcal{SU}_C(r, L)$ is a rational variety when $(r, d) = 1$, thereby settling the rationality question completely for the case when rank and degree are coprime.

We ask similar question over some specific reducible nodal curve. More precisely, let C be a *chain like curve* i.e., a reducible nodal curve with n smooth components C_i of genus $g_i \geq 2$ and $n-1$ nodes p_i such that $C_i \cap C_j = \emptyset$, whenever $|i - j| > 1$ and $C_i \cap C_{i+1} = \{p_i\}$, for $i = 1, 2, \ldots, n-1$. Let $\mathcal{U}_C(w, r, \chi)$ denote the moduli space of w-semistable pure sheaves of dimension one and Euler characteristic χ. Suppose L is a fixed line bundle on C of suitable Euler characteristic and $\overline{\mathcal{SU}_C(w, r, \chi, L)}$, the closure of the collection of all vector bundles in $\mathcal{U}_C(w, r, \chi)$ with determinant L. It was proved by Barik, Dey and Suhas that $\overline{\mathcal{SU}_C(w, 2, \chi, L)}$ is rational whenever $(2, \chi) = 1$ and $n = 2$. More recently, Favale and Brivio have proved it for higher rank under some extra assumption on the Euler characteristic. For $n \geq 2$, it was shown by Dey and Suhas that $\overline{\mathcal{SU}_C(w, 2, \chi, L)}$ is rational provided $(2, \chi) = 1$.

In this poster we investigate the rationality of $\overline{\mathcal{SU}_C(w, r, \chi, L)}$ for $r \geq 2$ and $n \geq 2$ under some conditions on the Euler characteristic. This is based on a joint work with Suhas B N and Amit Kumar Singh.

(18) **Amit Kumar Singh**, Chennai Mathematical Institute, India

On the stability of kernel bundles over chain-like curves Let $n \geq 2$ be a positive integer. Let C be reduced projective curve over $\mathbb{C}$ having n smooth irreducible components C_i of genus g_i and $n-1$ nodes p_i such that $C_i \cap C_j = \emptyset$, whenever $|i-j| > 1$ and $C_i \cap C_{i+1} = \{p_i\}$, for $i = 1, \ldots, n-1$. Such a curve C is called a *chain-like curve*. Suppose $\mathcal{V}$ is a nonzero finite dimensional vector space over $\mathbb{C}$ and $\mathcal{M}$ is a subbundle of the trivial bundle $\mathcal{V} \otimes \mathcal{O}_C$ over a chain-like curve C of $\mathrm{rk}(\mathcal{M}) = m$ and $\chi(\mathcal{M}) < 0$ such that the quotient $\mathcal{E} := \frac{\mathcal{V} \otimes \mathcal{O}_C}{\mathcal{M}}$ is locally free. Suppose also that $\mathcal{M}_{|_{C_j}}$ is semistable for each j. Then we prove that there exists a polarization w such that $\mathcal{M}$ is w-semistable. Further, we also prove that if $\mathcal{M}_{|_{C_j}}$ is stable for some j, then $\mathcal{M}$ is w-stable. Now, suppose E be a vector bundle of rank r on C and V is a linear subspace of $H^0(E)$ with $\dim V = k > r$ such that V generates E. We define the *kernel bundle* $M_{E,V}$ of the generated pair (E, V) to be the kernel of evaluation map $V \otimes \mathcal{O}_C \to E$. Let (E, V) be a generated pair on C. As a corollary of the above result, we also prove that if for each j, $M_{E,V|_{C_j}}$ is semistable, then there exists a polarization w such that $M_{E,V}$ is w-semistable. Further, we then provide some sufficient conditions under which $M_{E,V} \otimes L$ become strongly unstable, where L is any line bundle on C. This presentation is based on joint work with Suhas B N and Susobhan Mazumdar.

(19) **Shubham Sinha** UC San Diego, USA, ON-LINE ONLY

Tautological bundles over Quot scheme of curves. We find explicit formulas for the Euler characteristics of tautological bundles over punctual Quot schemes of smooth projective curve C that parameterize zero-dimensional quotients of a vector bundle E over C. The formulas suggest analogies between the Quot schemes of curves and the Hilbert scheme of points of surfaces. Our proofs rely on Atiyah-Bott localization, universality results (of Ellingsrud, Gottsche, and Lehn), and the combinatorics of Schur functions. For higher rank quotients, we obtain expressions in genus 0. This is joint work with Dragos Oprea.

(20) **Hugo Torres López**, Zacatecas, Mexico, ON-LINE ONLY

H-stability of syzygy bundles on some regular algebraic surfaces. Let L be a globally generated line bundle over a smooth irreducible complex projective surface X. The syzygy bundle M_L is the kernel of the evaluation map $H^0(L) \otimes \mathcal{O}_X \to L$. We prove the L-stability of M_L for Hirzebruch surfaces, del Pezzo surfaces and Enriques surfaces. This is joint work with Alexis Garcia Zamora (https://doi.org/10.1007/s13366-021-00594-z).

(21) **Fei Xiei**, University of Edinburgh, UK

Residual categories of quadric surface bundles. The residual category (or the Kuznetsov component) of a quadric surface bundle is the non-trivial component in the derived category. It is

equivalent to the twisted derived category of a double cover over the base when the quadric surface bundle has simple degeneration (fibers have corank at most 1). I will consider quadric surface bundles with fibers of corank at most 2 and describe their residual categories as (twisted) derived categories of some scheme in two situations: (1) when the bundle has a smooth section; (2) when the total space is smooth and the base is a smooth surface. Moreover, residual categories of certain complete intersections of quadrics can be described as an application.