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*The Zappa-Szép product of a Fell bundle by a groupoid*

In group theory, the Zappa-Szép product generalizes the semi-direct product. As the semi-direct product is related to the crossed product of operator algebras, we seek to define a Zappa-Szép product analogue. First, we define the notion of the compatible groupoid action on a Fell bundle, which allows us to define the Zappa-Szép product of a Fell bundle by a groupoid. We show that this product is a Fell bundle over the Zappa-Szép product of the underlying groupoids. We then show that the representation of the Zappa-Szép product Fell bundle is related to the notion of covariant representations. Finally, we briefly discuss some basic properties of its  $C^*$ -algebra. This is a joint work with Anna Duwenig.