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Linear topological invariants for kernels of differential operators

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Let $P(D)$ be a constant coefficient linear partial differential operator which is surjective on a given space of (generalized) functions $\mathcal{F}(X)$ on an open subset X of $\mathbb{R}^d$. Given data $(f_\lambda)_\lambda$ in $\mathcal{F}(X)$ that depend "regularly" on a parameter λ, it is a natural problem whether there exist solutions u_λ in $\mathcal{F}(X)$ to the equations $P(D)u_\lambda = f_\lambda$ such that $(u_\lambda)_\lambda$ also depend regularly on λ. By abstract functional analytic methods, it turns out that in many relevant situations, this problem has an affirmative solution when the kernel of $P(D)$ in $\mathcal{F}(X)$ satisfies a certain linear topological invariant for Fréchet spaces introduced by Vogt and Wagner in their seminal work [2], and generalized by Bonet and Domański to the setting of (PLS)-spaces in their influential article [1].

In the talk, we discuss these linear topological invariants for important classes of partial differential operators on the space of smooth functions and the space of distributions, respectively. Among others, we consider (subspace) elliptic operators and parabolic operators, and we give a complete characterization for arbitrary operators in case of $d = 2$.

Part of the talk is based on joint work with Andreas Debrouwere (Vrije Universiteit Brussel, Belgium).

References

[1] J. Bonet, P. Domański, Parameter dependence of solutions of differential equations on spaces of distributions and the splitting of short exact sequences, *J. Funct. Anal.*, **230** (2006), 329–381.

[2] D. Vogt, M. J. Wagner, Charakterisierung der Quotientenräume von s und eine Vermutung von Martineau, *Studia Math.*, **67** (1980), 225–240.