# Nielsen coincidence number of (n,m)-valued pairs of maps of a circle

Alan Żeromski[1],
joint work with Grzegorz Graff[2], P. Christopher Staecker[3]

[1] *Doctoral School, Gdańsk University of Technology*
[2] *Faculty Of Applied Physics and Mathematics, Gdańsk University of Technology*
[3] *Department of Mathematics, Fairfield University*

Given sets $X, Y$ and $n \in \mathbb{N}$, a map $f \colon X \multimap Y$ is *n-valued*, if for every $x \in X$ the image $f(x)$ has cardinality $n$ [5]. If for every $x \in X$ the image $f(x)$ has cardinality at most $n$, then a map $f \colon X \multimap Y$ is *at most n-valued.* A *graph intersection point* of a pair of multivalued maps $f$ and $g$ is defined as a point $(x, y) \in X \times Y$ for which $f(x) \cap g(x) \neq \emptyset$ and the *Nielsen coincidence number* is defined as the number of essential graph coincidence classes. In this talk we consider $(n, m)$-valued pairs of maps $f, g \colon S^1 \multimap S^1$ and for them we determine the Nielsen coincidence number, using the degree of some at most $nm$-valued map.

[1] Brown R.F., Kolahi, K. *Nielsen coincidence, fixed point and root theories of n-valued maps.* J. Fixed Point Theory Appl. 14, 309–324 (2013).

[2] Brown R.F., Goncalves D.L. *On the topology of n-valued maps.* Adv. Fixed Point Theory, 8 (2018), 205-220.

[3] Brown R.F. *Fixed Points of n-Valued Multimaps of the Circle.* Bulletin of the Polish Academy of Sciences. Mathematics 54.2 (2006): 153-162.

[4] Maxwell, C. N. *The degree of multiple-valued maps of spheres*, 1978.

[5] Staecker P.C. *Axioms for the fixed point index of n-valued maps, and some applications.* J. Fixed Point Theory Appl. 20, 61 (2018).