On improved Sobolev embedding theorems for vector-valued functions

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The improved Sobolev embedding theorem is the following inequality: For $1 \le p < q < \infty$,

$$\|\psi\|_q \le C\|\nabla\psi\|_p^{p/q}\|\psi\|_{B^{p/(p-q)}_{\infty,\infty}}^{1-(p/q)}$$

for every $\mathbb{C}$-valued function ψ on $\mathbb{R}^n$ with a constant $C > 0$, where $B^{p/(p-q)}_{\infty,\infty}(\mathbb{R}^n)$ is the homogeneous Besov space of indices $(p/(p-q), \infty, \infty)$ with norm

$$\|\psi\|_{B^{p/(p-q)}_{\infty,\infty}} := \sup_{t>0} t^{-p/2(p-q)}\|e^{t\Delta}\psi\|_\infty.$$

The aim of this talk is to give an extension of this embedding theorem for single-valued functions to the case of vector- valued functions which is involved with the three-dimensional massless Dirac operator together with the three- or two-dimensional Weyl–Dirac (or Pauli) operator, the Cauchy–Riemann operator and also the four-dimensional Euclidian Dirac operator. This is joint work with Yoshimi Saito (University of Alabama at Birmingham).