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<tr><th>authors</th><td>Paul M. N. Feehan</td></tr>
<tr><th>title</th><td>Optimal Lojasiewicz-Simon inequalities and Morse-Bott Yang-Mills energy functions</td></tr>
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<tr><th>volume</th><td></td></tr>
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<tr><th>abstract</th><td>For any compact Lie group G and closed, smooth Riemannian manifold (X,g) of dimension dâ‰¥ 2, we extend a result due to Uhlenbeck (1985) that gives existence of a flat connection on a principal G-bundle over X supporting a connection with L^p-small curvature, when p>d/2, to the case of a connection with L^d/2-small curvature. We prove an optimal Lojasiewicz-Simon gradient inequality for abstract Morse-Bott functions on Banach manifolds, generalizing an earlier result due to the author and Maridakis in arXiv:1510.03817. We apply this result to prove the optimal Lojasiewicz-Simon gradient inequality for the self-dual Yang-Mills energy function near regular anti-self-dual connections over closed Riemannian four-manifolds and for the full Yang-Mills energy function over closed Riemannian manifolds of dimension d â‰¥ 2, when known to be Morse-Bott at a given Yang-Mills connection. We also prove the optimal Lojasiewicz-Simon gradient inequality by direct analysis near a given flat connection that is a regular point of the curvature map. We also prove the Morse-Bott property for irreducible Yang-Mills U(n) connections over Riemann surfaces and hence a new proof of the optimal Lojasiewicz-Simon gradient inequality for such critical points.</td></tr>
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<tr><th>id</th><td>id7616213243065729814</td></tr>
<tr><th>abstract</th><td>For any compact Lie group G, we prove that the Yangâ€“Mills energy function obeys an optimal gradient inequality of Åojasiewiczâ€“Simon type (exponent 1/2) near the critical set of flat connections on a principal G-bundle over a closed Riemannian manifold of dimension d â‰¥ 2 and so its gradient flow converges at an exponential rate to that critical set. We establish this optimal Åojasiewiczâ€“Simon gradient inequality by three different methods. Our first proof gives the most general result by direct analysis and relies on our extension of a theorem due to Uhlenbeck [86] that gives existence of a flat connection on a principal G-bundle supporting a connection with L^d/2 -small curvature, existence of a Coulomb gauge transformation, and W^1,p Sobolev distance estimates for p > 1. Our second proof proceeds by first establishing an optimal Åojasiewiczâ€“Simon gradient inequality for abstract Morseâ€“Bott functions on Banach manifolds, generalizing an earlier result due to the author and Maridakis [31, Theorem 4]. Our third proof establishes the optimal Åojasiewiczâ€“Simon gradient inequality by direct analysis near a given flat connection that is a regular point of the curvature map. We prove similar results for the self-dual Yangâ€“Mills energy function near regular anti-self-dual connections over closed Riemannian four-manifolds and for the full Yangâ€“Mills energy function over closed Riemannian manifolds of dimension d â‰¥ 2, when known to be Morseâ€“Bott at a given Yangâ€“Mills connection</td></tr>
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