Info

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Gauge theory on G-bundles

Definition. Gauge theory

Let M be a smooth manifold and

$$\begin{tikzcd} P \arrow[d] & \curvearrowleft & G \\ M \end{tikzcd}$$

be a G-bundle over M where G is a Lie group with Lie algebra $\mathfrak{g}$.

Then	is called
the G-bundle P	**gauge bundle** on M
a $\mathfrak{g}$-valued 1-form on P $$A \in \Omega^1(P, \mathfrak{g})$$	**gauge potential** on M
curvature of A $$\mathrm{d}A + \frac{1}{2}[A, A] \in \Omega^2(P, \mathfrak{g})$$	**gauge field** on M

A **gauge theory** is a tuple

$$\left(\begin{tikzcd} P \arrow[d] & \curvearrowleft & G \\ M \end{tikzcd}, \rho : G \to GL(V), \mathcal{A} \right)$$

where $\rho : G \to GL(V)$ is a finite dimensional $\mathbb{R}$-representation

Then	is called
V	**target space for matter fields**
$$\begin{tikzcd} P \times_\rho V \arrow[d] \\ M \end{tikzcd}$$	**matter vector bundle** over M
global section ϕ of E_ρ	**matter field** on M

and an **action** function

$$\begin{aligned} \mathcal{A} : \Omega^1(P, \mathfrak{g}) \times \Gamma(P \times_\rho V) &\to \mathbb{R} \\ (A, \phi) &\mapsto \mathcal{A}(A, \phi) \end{aligned}$$

Current note has 0 direct children and 0 total descendants.

- structures based on sets
  - manifolds
    - Principal bundles over smooth manifolds
      - Gauge theory on G-bundles

And it has 2 siblings.

- structures based on sets
  - manifolds
    - Principal bundles over smooth manifolds
      - Cartan geometry
      - Gauge theory on G-bundles