Bonn Universität
Mathematik-Zentrum
Sommersemester 2020
April 8, 2020

S2D1-Hauptseminar Geometrie
S4D1-Graduate Seminar on Differential Geometry
Prof. Dr. Ursula Hamenstädt
Dr. Matteo Costantini

S2D1-Hauptseminar Geometrie
S4D1-Graduate Seminar on Differential Geometry

The geometry of foliations

Sommersemester 2020

The seminar takes place online until further notice
Time: Tuesday, 16.30h

1. **Foliations and fibrations; the Reeb foliation.**
   (April 21, 16.00-18.00) M. K.

   Define foliations and explain how they can arise from submersions and fibrations. Describe the Reeb foliation.

   Literature: [p. 21-27][**camacho-neto**] .

2. **Lie group actions and transverse maps.**
   (April 28, 16.00-18.00) S.J.A.

   Define Lie groups and give some example. Explain that if the action of the Lie group on a space is sufficiently nice, orbits are leaves of a foliation. Explain the concept of transerve maps.

   Literature: [p. 28-35][**camacho-neto**] .

3. **The existence of a foliation on any orientable 3-manifold.**
   (Mai 5, 16.00-18.00) S.J.

   Plane fields and foliations, Frobenius' theorem (without proof), proof of the main result.

   Literature: [p. 35-36, 39-41, 45][**camacho-neto**] .

4. **The space of leaves, closed leaves, minimal sets.**
   (May 12, 16.00-18.00) K. J.

   Define and explain properties of the space of leaves. Discuss about closed leaves and minimal sets.

   Literature: [p. 47-53][**camacho-neto**] .

5. **Holonomy of a foliation.**
(May 19, 16.00-18.00) K. H.

Explain what is the holonomy of a foliation and discuss the global trivialization theorem.

Literature: [p. 61-70][**camacho-neto**] .

6. **Stability results for foliations.**
(May 26, 16.00-18.00) He. Lu.

Prove the local and global stability theorems for foliations.

Literature: [p. 70-80][**camacho-neto**] .

7. **Foliations and flat bundles**
(June 2, 16.00-18.00) Ho. Le.

Define the suspension of a representation, flat bundles and explain the relation between flat bundles and foliated spaces.

Literature: [p. 87-101][**camacho-neto**] .

8. **Haefliger's theorem**
(June 9, 16.00-18.00) S. R.

Formulate Haefliger's theorem; explain the reduction to the study of foliations with singularities on the disk and give an overview of the important properties of such foliations

Literature: [p. 115-129][**camacho-neto**] .

9. **Novikov'ss theorem I.**
(June 16, 16.00-18.00) B. D.

State and begin the proof of Nokivov theorem, focusing on vanishing cycles.

Literature: [p. 132-139][**camacho-neto**] .

10. **Novikov's theorem II.**
(June 23, 16.00-18.00) F. J.

Conclude the proof of Novikov theorem.

Literature: [p. 140-149][**camacho-neto**] .

References

[camacho-neto] C. Camacho, A. Lins Neto, *Geometric theory of foliations*, Birkhäuser, Boston 1985.