Filippo De Mari Casareto Dal Verme

Associate professor

filippo.demari@unige.it
+39 3472514629

Education and training

1983
Laurea in Matematica
Algebra di Volterra di distribuzioni invarianti con supporto in un cono omogeneo - 110/110 e lode
Università di Genova - Genova - IT

1987
Ph. D. in Mathematics
On the topology of the Hessenberg varieties of a matrix.
Washington University - Saint Louis Missouri - US

Academic experience

1988 - 1989
Wissenschaftlichermitarbeiter
Universität Bremen - Bremen - DE
Research teaching

1990 - 1992
Postdoc
Politecnico di Torino - Torino - IT
Research

1992 - 1998
Researcher in Mathematical Analysis
University of Genova - Genova - IT
Research teaching

1998 - ONGOING
Associate Professor in Mathematical Analysis
University of Genova - Genova - IT
Research teaching administration

Language skills

English
Proficient

German
Independent

Teaching activity
In my career I have tought courses on:
Mathematical Analysis (first two years for undergraduate students in Mathematics, Physics, Computer Science Engineering), Fourier Analysis (Masters students in Mathenmatics), Lie groups and Lie algebras (Masters and PhD students in Mathenmatics), Representation theory (Masters and PhD students in Mathenmatics)

Research interests
My main scientific interests are in the fields of Harmonic Analysis, Signal Analysis, Lie groups, Representation Theory. In recent years I have worked primarily on:
Reproducing formulae for functions. In many situations of practical interest, for instance in signal analysis, the natural space H of functions that one wants to use is either L^2(R^d) or some closed subspace thereof. Often times, H is stable under natural transformations (e.g. translations, modulations, rotations), a fact which may be formalized by saying that H is the representation space of some (Lie) group G. In this case, there is a unitary representation U of G, which assigns to each element g of G a unitary map U(g) of H into itself. This happens in many areas of classical Harmonic Analysis: Fourier analysis, Gabor, Wavelets, Shearlets are some instances in which such a U is given with several important properties. The one property on which I have been mostly interested (together with collaborators Alberti, Balletti, Bartolucci, Cordero, Dahlke, De Vito, Häuser, Labate, Mantovani, Nowak, Odone, Steidl, Tabacco, Teschke, Vigogna) is the so-called square-integrability of U, or variants. This amounts to saying that there is a special element u in H (often referred to as the analyzing vector) with the property that any other v in H can be reconstructed via an integral formula (with respect to Haar measure) from the set of all the projections of v along the directions U(g)u as g varies in G. One significant class of examples arises when restricting the metaplectic representation to special block-triangular subgroups of the symplectic group, on which we have worked exensively.
Coorbit spaces. In the eighties, Feichtinger and Gröchenig introduced the notion of coorbit space. Roughly speaking, a coorbit space is defined via the decaying properties of some kind of transform on a function space H. Typically, such a situation occurs whnever U,G and H are as above. Then the so-called voice-transform is nothing but the function that sends any v on H into the map on G defined by <v,U(g)u>, the inner product (in H) of v with U(g)u. Under suitable integrability assumptions on the kernel K(u)=<u,U(g)u>, one can construct spaces of distributions on the same space on which the functions of H are defined and extend the voice transform on them. The coorbit space are characterized by assigning a space of functions on G to which the distributional voice transforms should belong.
Radon transforms. This very well known mathematical device is used in

many applications, notably in Medical Imaging where it is the at the root of CT scan technology. Put it in general mathematical terms, the Radon transform is a transform which assigns to a function f defined on some ambient space X (typically Euclidean space or more generally some manifold) a function on a space Y which parametrizes a family of submanifolds of X. Thus a point y in Y is a specific subset of X and the value Rf(y) of the Radon transform of f at the point y is the integral of f over the set y. The basic example is when X=R^3 and Y is the set of lines in R^3, so that Rf(y) measures the radiation absorbtion of the body f when a radiation is sent along the line y. The basic question is to under which circumstances and in what sense it is possible to reconstruct f if one knows (all) the values of Rf. The primary focus of the investigations with collaborators Alberti, Bartolucci, De Vito, Monti and Odone are the properties of the Rdon transform as defined in general setup of 'dual pairs' by Helgason (and under somewhat weaker assumptions by us) in connection with representation theory.