consider them in some normed function spaces, e.g. of integrable functions such as L_p or weighted L_p spaces, e.g. Carrasco, Florens and Renault (2007). Solving the equations is often done by employing Fourier transforms. Since convolutions and Fourier transforms can be defined in different spaces, the question is which spaces are best suited for the problems.

Devroye and Győrfi (1985) view density from the perspective of L_1 space since the density (when it exists as a function) is absolutely integrable. However, in various problems of interest density may not exist, as in cases of measurement error for individuals answering survey questions (say, about income or consumption) where the probability of truthful reporting is non-zero and a mass point can arise (Hu, 2008). Density functions in L_1 do not necessarily converge even if the corresponding distribution functions converge uniformly. The way to overcome both the non-existence of density and convergence problems is to consider density as a generalized derivative of the distribution function as proposed in Zinde-Walsh (2008); this is done by defining the distribution function as a functional on a suitable space of well-behaved differentiable functions so that with this definition the distribution function inherits the good properties of the well-behaved functions and becomes differentiable (details in Zinde-Walsh, 2008, also see section 2.1 below); moreover, in the space of generalized functions the generalized densities converge if the distribution functions converge thus the problem of defining the density for a distribution is well-posed there.

Working in spaces of generalized functions also extends the classes of