Uniformly Defining Complexity Classes of Functions

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We introduce a general framework for the definition of function classes. Our model, which is based on polynomial time nondeterministic Turing transducers, allows uniform characterizations of deterministic classes (FP), counting classes (#·P, #·NP, #·coNP, GapP, GapNP), optimization classes (max·P, min·P, max·NP, min·NP), promise classes ($\#_{\mathrm{few}}$·P, c#·P), and many more. Each such class is defined in our model by a certain family of functions. We introduce a reducibility notion between such families, which allows us to develop a necessary and sufficient criterion for relativizable inclusion between function classes. As it turns out, our criterion is very easily applicable and we get as a consequence e.g. that relative to some oracle, min·P $\not\subseteq$ #·NP.