Modern manufacturing needs to optimize the entire product lifecycle to satisfy the highly diverse customer needs. With the deployment of Industrial Internet and sensor/actuator networks, data-driven decision making is expected to enable smart manufacturing to achieve high level of adaptability and flexibility. Such a manufacturing system generates spatially and temporally dense data sets. This talk focuses on manufacturing modeling problems and data interpretation with functional data, where the models will be used in data-driven decision making in smart manufacturing. Examples in functional variable selections, in situ process modeling, and data interpretation from natural language processing perspective will be discussed in this talk. The methodology has been broadly applied to many advanced manufacturing processes, such as aero-engine manufacturing, crystal growth manufacturing, and additive manufacturing.