Figure 4: Task share dynamics of different Information Technology task clusters across HML wage occupations.

Figure 5: One-step ahead predictions of task-shares of selected task clusters families across HML wage occupations.

gence' and 'Big Data' task clusters had low task-shares in the high wage occupations, their demand increased at a very high rate during 2010-2017. These task-cluster have not seen any demand in the mid and low wage occupations. On the one hand, task clusters like 'Scripting Languages' (includes Python) and 'Cloud Solutions' are gaining task-shares in high wage occupations. On the other hand, most IT task clusters are losing task-shares in low wage occupations. This evolution of IT task demands confirms the industry trends towards developing AI-based products and services in the Cloud requiring workers to perform AI, Big Data, Scripting Languages, and Cloud Solutions based tasks while focusing less on traditional software products and services that require workers to perform SQL, Java, and Data Management oriented tasks.

Task-Share Forecasting

In addition to the insights already extracted, this study and dataset lays down the scope and foundation for detailed exploration of the evolution of occupations (and the tasks within) across different industries in the US labor market. The task-shares time-series data creates an opportunity to learn the dynamics of task and occupations, and, then quantitatively predict the task-shares for near future with confidence bounds. Such predictive capabilities on the labor market might help the workers reskill themselves, corporations retrain their employees, or, new graduates to learn the skills to be able to execute the tasks of the future. In the first phase of this study, we have trained an autoregressive integrated moving average (ARIMA) model (**?**) to learn the representation dynamics of the task-shares of different task cluster families across HML wage occupations over the first 72 months of data (2010-2016). Using this trained ARIMA model, we make one-month ahead predictions of the task-shares. The mean absolute percentage error (MAPE) of predictions is considerably less than 5% in most cases as shown in Table **??**. In Fig. 5, we plot the task-share forecasts (black lines) with 95% confidence intervals (grey areas) to compare against the true task-shares (dotted lines) for a few selected task cluster families across high (red line), mid (green line),
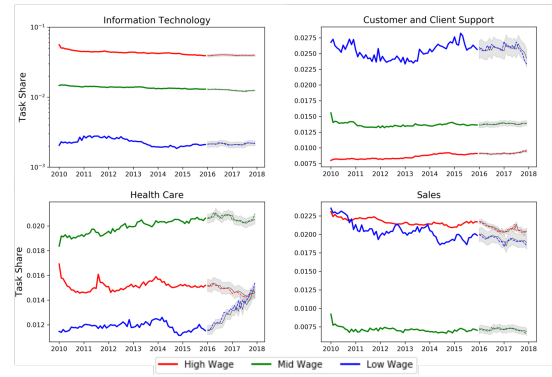
and low (blue line) wage occupations. The accuracy of the task-share predictions is a clear indicator towards the benefit of developing robust and more accurate forecasting models to characterize the evolution of occupations and the tasks therein.

Conclusions & Next Steps

Some of the task trends are striking. Notably, the fast rise of Big Data and Artificial Intelligence in high wage occupations since 2012 and 2016, respectively. This delayed, yet rapid development seems similar to the adoption of electricity in the 1890s as well computers in the 1970s - both started slow and labor productivity growth did not take off for over twenty years (**?**). Thus, we may have another decade or so giving workers ample time to adapt with the occupational transformation.

This empirical research sheds new light on the transformation of work by characterizing occupations in terms of task-shares dynamics. There are still many open questions remaining in the study. To extract further empirical evidence as to what is occurring in the US labor market, it would be crucial to investigate: (a) how task-share dynamics are evolving across different industries and across different geographical/Metropolitan regions within the country; (b) dynamic functional coupling between different task-shares across occupation groups; and, (c) impact of task-share dynamics on wage-dynamics and vice versa. Today, we know the change AI and new technologies will bring to the labor market is still relatively small, but real. To prepare for continued adoption and advancements in the technologies, an immediate next step will involve the development of accurate, comprehensive and robust predictive models, using Gaussian Processes or long short-term memory (LSTM) based artificial recurrent neural networks (RNN), so as to provide guidance to workers, employers, and new graduates on skills and tasks of the future.

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