

Georgia Institute of Technology - Web Industries

Georgia Institute of Technology Spring 2019 ISYE Senior Design capstone project with Web Industries.

Getting Started

These instructions will get you a copy of the project up and running on your local machine for development and testing purposes.

To simply run the application, see [App](#)

Prerequisites

Python 3.6+. Can be installed for your operating system [here](#).

Development

Clone the repository with

```
git clone https://github.com/nzqs/sdteam17.git
```

It's recommended to use a virtual environment to manage the project packages. Navigate to the project's directory.

If you are using Conda, create the environment and activate with

```
conda create -n envname python=3.6
source activate envname
```

Or use the venv module (Python 3.3+)

```
python3 -m venv envname
```

Activate the virtual environment depends on platform. Posix:

```
$ source envname/bin/activate
```

Windows (cmd.exe or PowerShell):

```
C:\> envname\Scripts\activate.bat
PS C:\> envname\Scripts\activate.ps1
```

Installing

wxPython is required to run the graphical user interface. It can be installed with pip

```
pip install -U wxPython
```

This project also uses Google's OR-Tools. They can also be installed with pip

```
pip install --upgrade --user ortools
```

Install the rest of the requirements with

```
conda install --yes --file requirements.txt
```

or

```
pip install -r requirements.txt
```

- Some packages may fail to install. Install these manually and remove them from requirements.txt

Usage

Run the GUI application with the driver

```
python3 driver.py
```

App


Download the standalone executable tool [HERE](#)

Please note this only supports Windows 8.1 or Windows 10.

Deliverable Instructions

Schedule

Input an Excel Spreadsheet with the jobs to be scheduled and output a schedule that minimizes the makespan of all jobs. Please be advised that the tool is for aiding scheduling decisions, and that discretion should still be exercised.



Web Industries Scheduling
 Georgia Tech Senior Design Project
 Author: Nicholas She

Schedule
 CMF
 p*

Constrained programming scheduling tool

Specify input and output parameters

Schedule_Input Input jobs Excel file <input type="text"/> <input type="button" value="Browse"/>	write_schedule Write schedule to given path. <input type="text"/>	sheet Sheet to read <input type="text" value="Sample 1"/>
processing Processing time column <input type="text" value="p*"/>	WO Work order column <input type="text" value="WO"/>	set Set column <input type="text" value="Set"/>
material Material or PN column <input type="text" value="Resin Type"/>	width Width column <input type="text" value="Width"/>	due Due date column <input type="text" value="Due Date"/>

Config options

Recommended values

truncate <input type="text" value="Yes"/>	start_time Schedule start time. Follow the example format <input type="text" value="2019-04-21 20:19"/>
max_run Maximum model run time in seconds <input type="text" value="300"/>	output_proto Write CP model to output (for debugging) <input type="text"/>

preprocess_times
☒ Preprocess setup times and durations

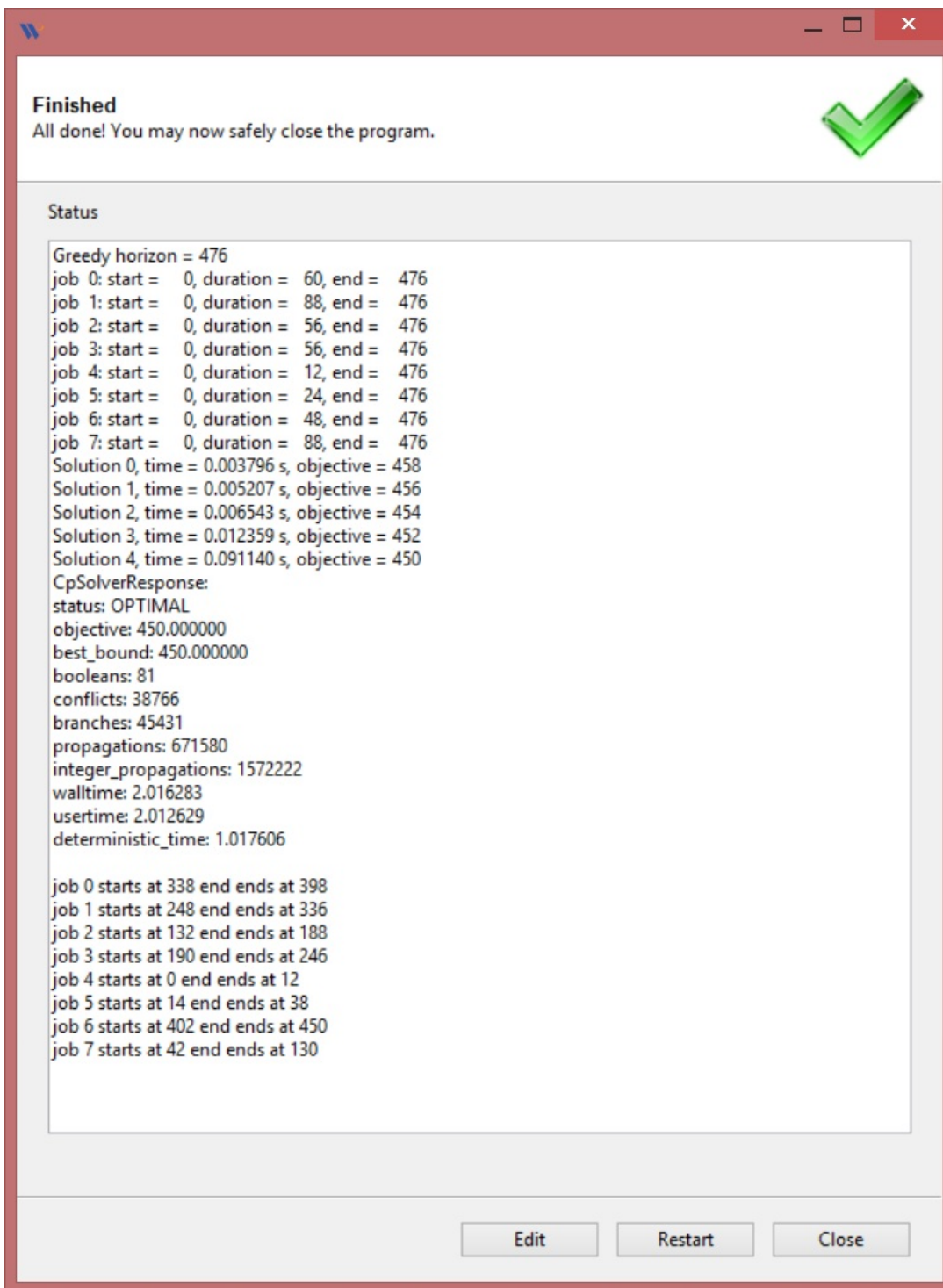
Constrained programming scheduling tool

Field	Explanation
Schedule_Input	Input Excel File
write_schedule	Path to write output to
sheet	Name of sheet with the jobs
processing	Column of processing times. Populate this column from the p* tab
WO	Column of Work Orders
set	Column of sets in a Work Order
material	Column of the resin type or material
width	Column of the slit widths
due	Column of due dates

Config Options

Field	Explanation
truncate	If Yes, will group sets together in their respective Work Orders, then schedule Work Orders as jobs. The processing time will be the sum of the processing times of the sets. If No, will schedule each set as a job. Using yes will greatly speed up solution time
start_time	When to start the first job of the schedule
max_run	Maximum time in seconds to run the tool. If reached, will output the best schedule found up to that point
output_proto	Write the model into a file
preprocess_times	Build minimal setups into the job duration. Keeping this ticked will speed up the tool

Example run:



CMF

CMF tab is for inputting historical data to fit empirical mass distributions of processing times for different materials. We use these distributions when calculating optimal allotted processing times in the [p*](#) tab.

To update old data, simply upload updated data with the same unique column keys; the old data with those unique column keys will be updated, while the rest of the saved data will be preserved. To delete *all* saved data, delete the file `cmfs.pickle`.


Load or modify historical data

Field	Explanation
CMF_Input	Input Excel file containing historical data
sheet	Name of the sheet containing historical data
mat_col	Column of which material or resin jobs were
mach_col	Column of which machine jobs were ran on
estim_col	Column of the estimated processing time used
actual_col	Column of the actual processing time each job took

The historical data describes the processing times of previous jobs. The unique combination of Machine, Material Type, and Estimated Time determines how the distributions are grouped.

p*

Calculate a value of p^* to use in the schedule. Requires historical data to be loaded from the **CMF** tab. Again, grouped by unique combination of Machine, Material Type, and Estimated Time.



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Schedule
CMF
p*

Required Arguments

theta
Cost per hour of job earliness

delta
Cost of an exceed out time incident

Material
Choose which material to examine

Cancel
Start

Required Arguments

Field	Explanation
theta	Dollar cost per hour of machine downtime
delta	Dollar cost per exceed out incident that fails testing
Material	The material we wish to find allotted processing time for.

After calculating p^* , manually enter it into the input file of [Schedule](#). This is to ensure a human has the final review of any scheduling decisions made.

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