

AI -PDET
(Artificial Intelligence based Project Duration Estimation Tool)

User Manual

Version 1.0 (June 2023)



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1 Overview

The MS Excel Tool is named AI-PDET (Artificial Intelligence based Project Duration Estimation Tool). AI-PEDT is a powerful tool to estimate the duration of a construction project. This data driven tool can serve as a quick tool to predict the duration of a construction project when an estimated construction cost and estimated quantities of major work items are available. AI-PDET is a Microsoft Excel based tool that requires Excel macros that must be enabled. This manual provides a step-by-step guide on how to use the tool.

2 Initial Setup

2.1 Getting Started

To use the AI-PDET, click the **Enable Content, Enable Editing, or Enable Macros** button that appears when the tool is first opened (depending on version of Windows) (Figure 1). If a user's computer is set up to enable macros automatically in advance, the user will not see the Security Warning Dialogue Box.

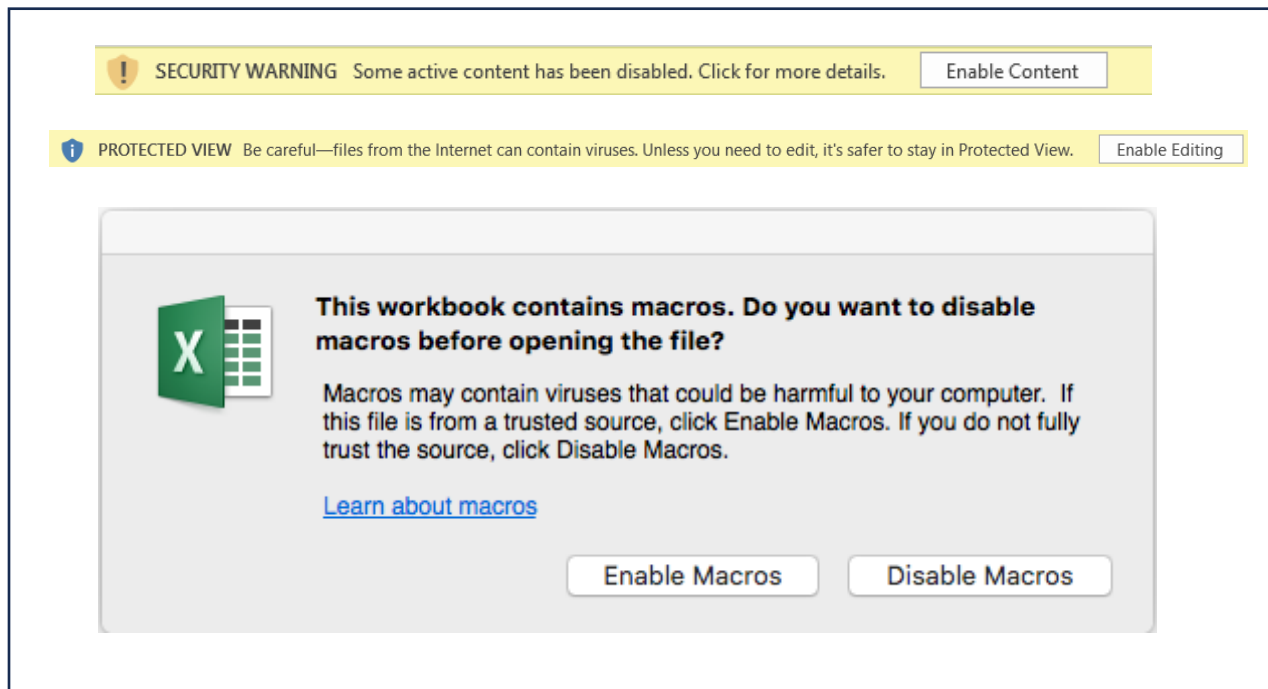


Figure 1. Security Warning Dialogue Box

2.2 Launching AI-PDET

Once the AI-PDET is opened, users see the tool's home page as shown in Figure 2. The user is provided with basic instruction on how to use the tool to obtain the duration of a construction and a caution when the estimated project amount is larger than \$8M. The AI-PDET includes three sheets; i) home page, which provides a general guideline on using the tool, ii) Project duration estimation work sheet, that takes input variables and predicts the duration of the project with two different methods of the ANN model and the regression model, iii) sample projects sheet, which includes the information of three real cases to provide examples of using the tool. Clicking the “Start Analysis” button opens up the next worksheet.

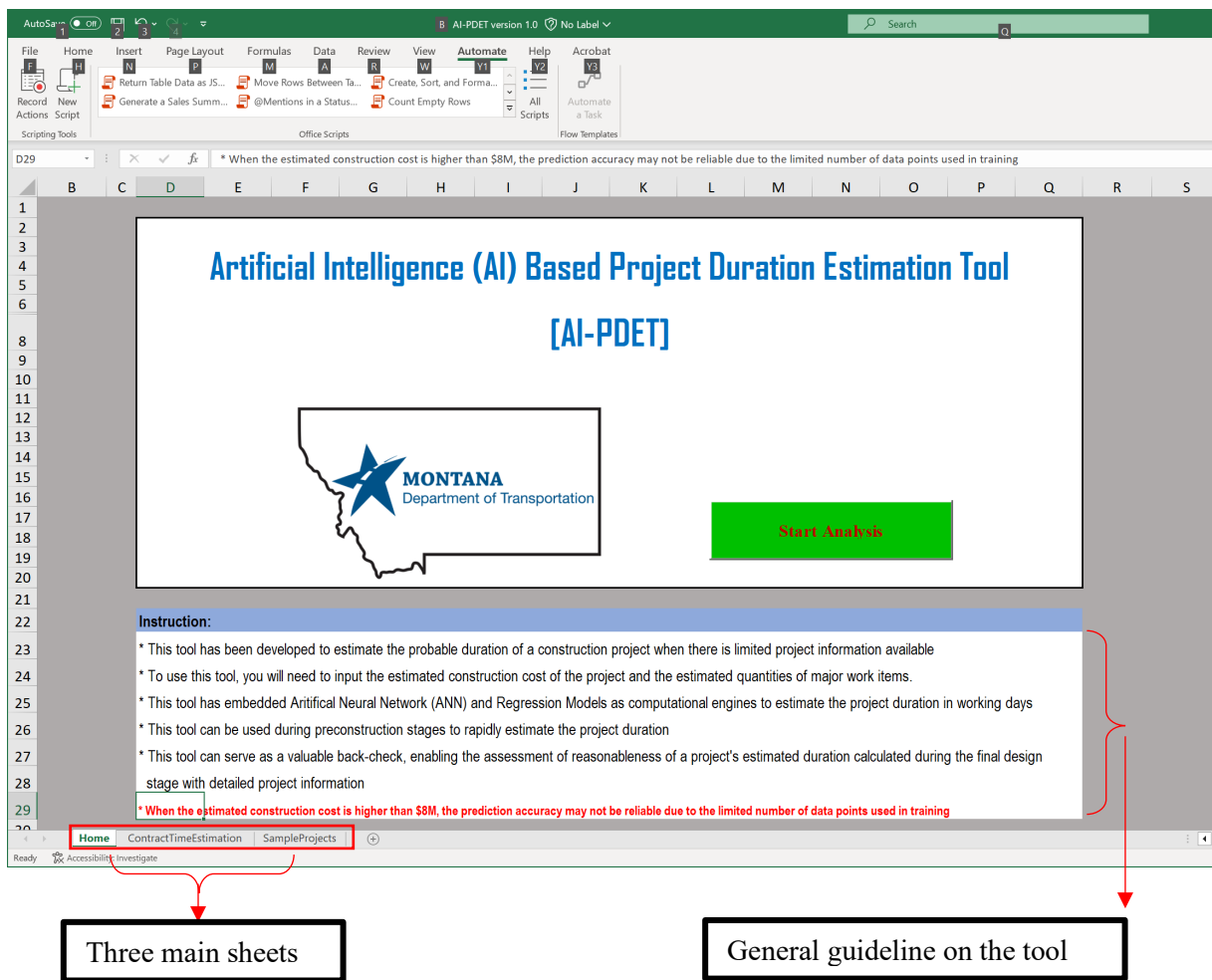
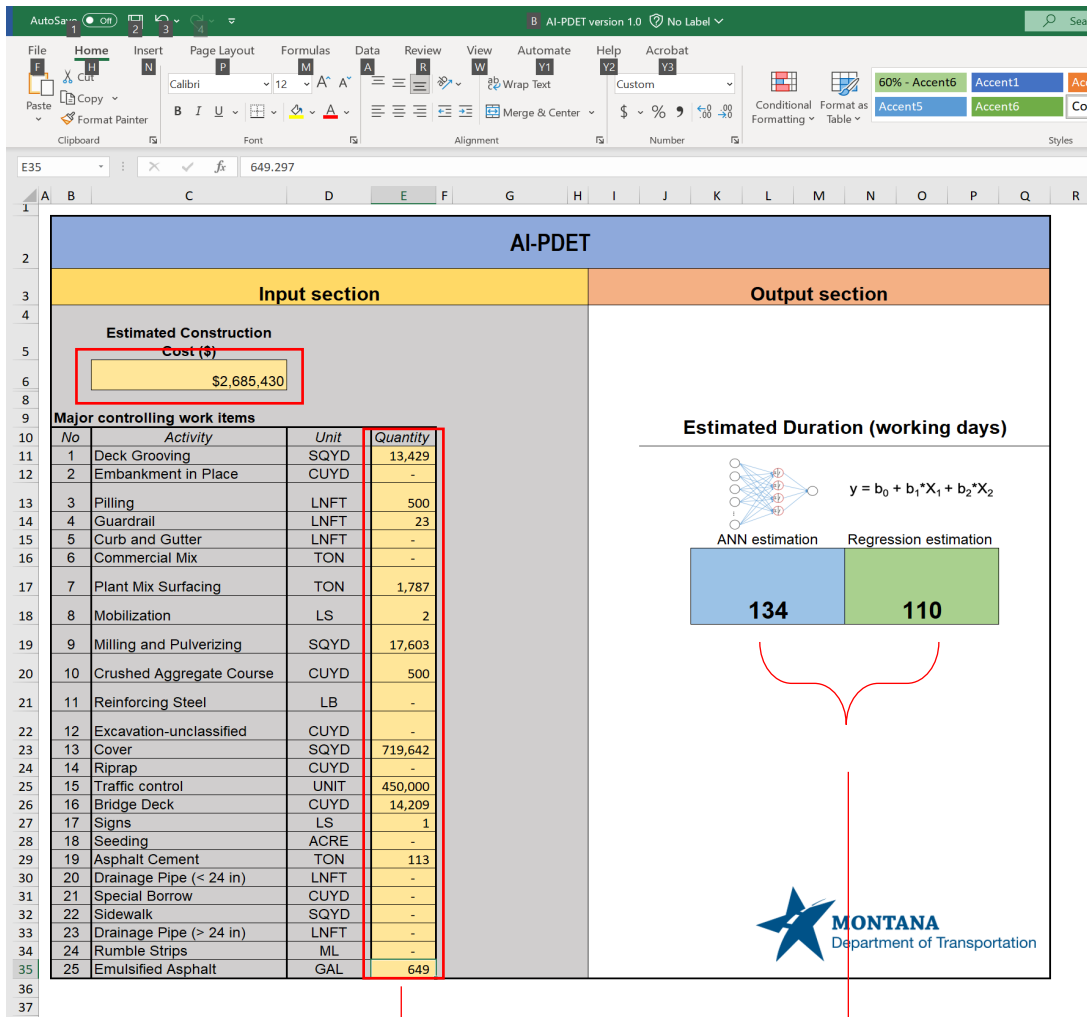


Figure 2 Screenshot of AI-PDET home page

3 Project Duration Estimation Worksheet

Figure 3 illustrates the second page of the tool in which a user enters input variables in the input section and then, the output section shows the two estimated project durations predicted from ANN and regression models. The input section takes the estimated quantity of each of the 25 major work items and the estimated construction cost of the project in the yellow cells. Each major work item may include one or multiple pay items. After the input section is completed, AI-PDET automatically presents the predicted project durations in the output section.



Yellow cells are input variables must be entered by the user

The output section provides the project time estimation using two methods

Figure 3 Screenshot of the AI-PDET Input and Output Sheet

4 Sample projects Sheet

The third page of the AI-PDET includes three cases of real highway projects in MDT (Figure 4). The first project is categorized as "Miscellaneous," the second as "Bike and pedestrian," and the third is a "Bridge construction" work type. All projects started in 2019. The actual charged days of each project are provided in the sheet to help the user to compare it with the predicted project durations with the AI-PDET. The quantities of major work items with their proper units are provided for each project. When the user takes the provided input values and enters them in the second sheet of the AI-PDET, the user can see the predicted project durations on the right-hand side and compare them with the real duration of the project.

<i>Project characteristics</i>	<i>Case1</i>	<i>Case2</i>	<i>Case3</i>
Project number	9617133000	9149077000	8085164000
Project ID	IM 90-9(133)528	TA 41(77)	
Project type	MISCELLANEOUS	BIKE AND PEDESTRIAN	BRIDGE CONSTRUCTION,RE
Project location	Bighorn County	Ravalli County	Cascade County
Project begin year	2019	2019	2019
Engineers' estimate (\$)	\$ 2,682,663	\$ 519,287	\$ 5,980,982
Project time (working days)	75	42	162
Resource	MDT website	MDT website	MDT website
<i>Activity quantities</i>			
Deck Grooving	0	0	0
Embankment in Place	0	0	31.56
Pilling	0	0	0
Guardrail	5	0	0
Curb and Gutter	0	0	0
Commercial Mix	398	0	1006.23
Plant Mix Surfacing	0	0	0
Mobilization	1	1	1
Milling and Pulverizing	0	0	6322.2
Crushed Aggregate Course	540.15	30.5	0
Reinforcing Steel	0	0	30444
Excavation-unclassified	0	507.9	0
Cover	5188.7	0	7441
Riprap	0	0	0
Traffic control	19916	1	295704
Bridge Deck	0	0	0
Signs	0	0	360
Seeding	2.9	0	0
Asphalt Cement	0	0	0
Drainage Pipe (< 24 in)	0	0	0
Special Borrow	0	0	0
Sidewalk	0	1231	0
Drainage Pipe (> 24 in)	0	0	0
Rumble Strips	0	0	0
Emulsified Asphalt	10.44	0	0

Figure 1 Screenshot of the sample projects sheet of AI-PDET

5 Results Interpretation and Model Limitations

The AI-PDET is a top-down tool that can estimate a project's duration when a limited amount of project information is available during the preconstruction stages. The estimated project duration

using this tool is helpful in the early stages of the project delivery process for project programming and budgeting purposes. It can also be used to check the reasonableness of the project duration estimate derived from detailed project scheduling activities, once more detailed information on activity quantities, production rates, and activity sequencing become available in later design stages.