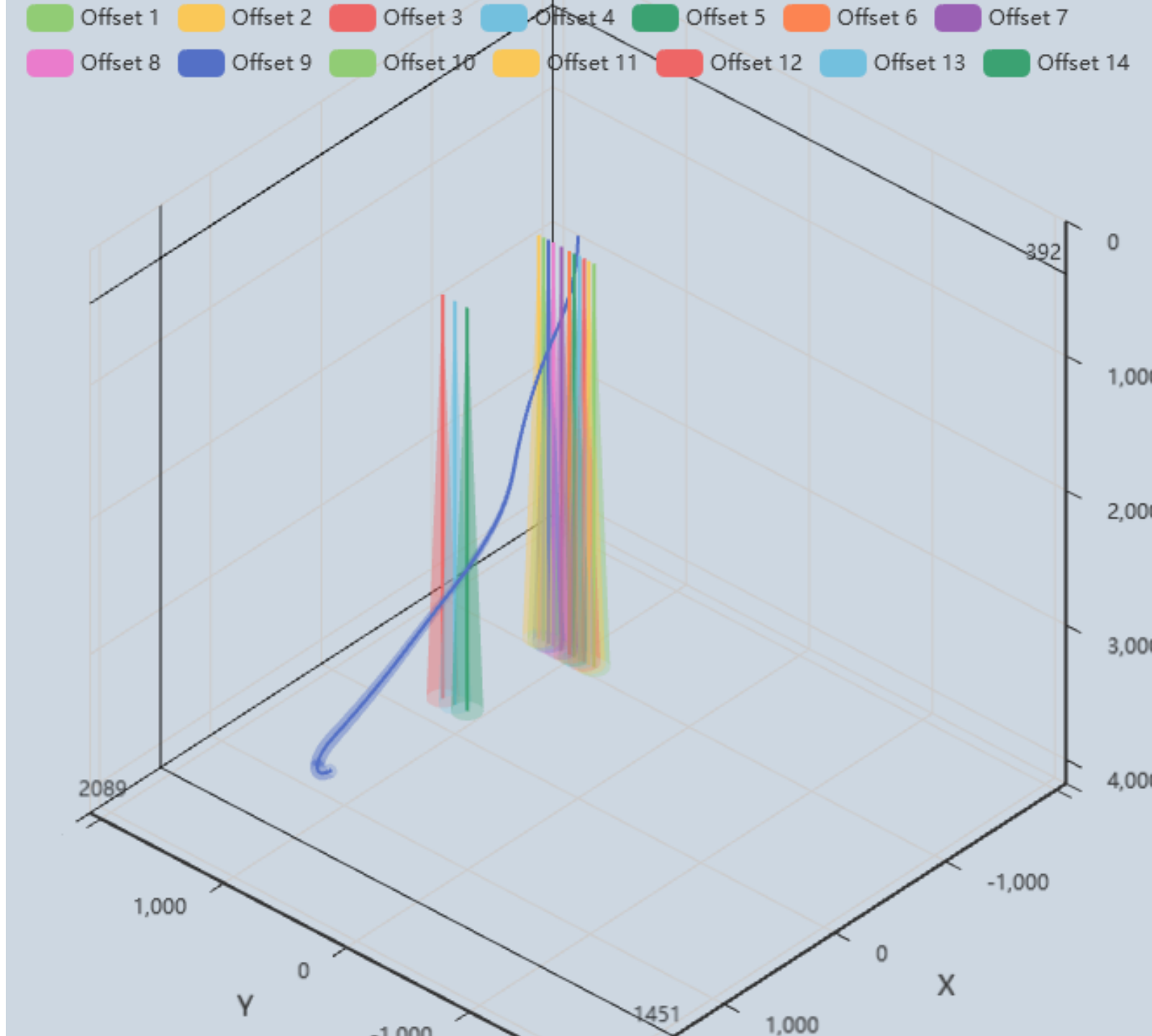


AI/DE Trajectory Design

User Manual



General Info

- The primary objective of AI/DE is to automate the design of trajectories for oil, gas, and geothermal wells
- AI/DE automates the tasks of drilling engineers and well planners in developing well paths. It takes into consideration anti-collision with offset wells, sets limits for dog leg severity and inclination for different well sections, and ESP placement; the app automatically finds the shortest well path that meets the requirements in minutes
- To generate solutions, artificial intelligence (AI) methods are employed, which may not always yield consistent results. Consequently, each subsequent solution can vary slightly or, at times, significantly from its predecessor
- Anti-collision calculations are based on SPE-67616, SPE-108279, and ISCWSA toolcodes rev 4

Start New Task

1. To start New Task
click New Trajectory

The screenshot shows the 'AI/DE' interface for creating a new trajectory. On the left, a sidebar contains a '+ New trajectory' button (highlighted with a red box) and a list of tasks, each with a green checkmark and an 'X' icon. At the bottom of the sidebar, there is a user profile for 'Test user' with email 'test@test.a' (highlighted with an orange box) and an 'Upload a file' button (highlighted with an orange box). The main content area is titled 'New trajectory' and features a progress bar with seven steps: 1 Info, 2 Base trajectory, 3 Targets, 4 Limits, 5 AC settings, 6 Offset wells, and 7 Review. The 'Info' step is active. Below the progress bar, the form is divided into three sections: 'General', 'Location', and 'Geomagnetic reference'. The 'General' section has a text input field for 'Name' containing 'Fence Traversal' (highlighted with a red box) and a red annotation '2. Fill References'. The 'Location' section contains three input fields: 'Latitude (deg)' with value '60', 'Longitude (deg)' with value '0', and 'Altitude (m)' with value '0'. The 'Geomagnetic reference' section contains five input fields: 'G (m/s2)' with value '9.80665', 'B (nT)' with value '50000', 'Dip (deg)' with value '72', 'Dec (deg)' with value '0', and 'Grid (deg)' with value '0'. At the bottom right, a blue 'Next' button is highlighted with a red box. A red annotation '3. Click Next' is located at the bottom right of the image.

You can click here
to change the password

You can upload Task
from JSON file

3. Click Next

Base Traj Info

AI/DE Enter the existing part of the subject well

New trajectory

Info 2 Base trajectory 3 Targets 4 Limits 5 AC settings 6 Offset wells 7 Review

1. Enter the wellhead

Wellhead

NS (m)	EW (m)	TVD (m)
<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>

2. Copy-paste the MD/Inc/Az

MD (m)	Inc (deg)	Az (deg)
0	0	0

Paste MD/Inc/Az here

3. Enter the Survey Program

Start MD (m)	Stop MD (m)	Toolcode
Start	End	<input type="text" value="MWD"/>

+

Back Next

Test user
test@test.a ➔

4. Click Next

Targets

AI/DE

New trajectory

1. Enter the Target

Info Base trajectory **3 Targets** 4 Limits 5 AC settings 6 Offset wells 7 Review

Target T1

NS (m)	EW (m)	TVD (m)	Inc (deg)	Az (deg)
2000	200	3000	90	180

Production targets

Max vertical deviation (m) Max lateral deviation (m)

10	1
----	---

Name	NS (m)	EW (m)	TVD (m)
+			

Back **Next**

Test user test@test.a

2. Click Next

Section Limits

AI/DE

New trajectory

1. Enter Limits for ESP

Info Base trajectory Targets **Limits** AC settings Offset wells Review

Global

Max DLS (deg/30m)

10

ESP

Start TVD (m) End TVD (m) Min inc (deg) Max inc (deg) Max DLS (deg/30m)

1900 2000 40 70 1

Section limits

Name	Start TVD (m)	End TVD (m)	Min inc (deg)	Max inc (deg)	DLS (deg/30m)
Section 1	Start	1000	0	30	2
Section 2	1000	2000	0	180	5
Section 3	2000	End	0	180	10

+

2. Enter Limits for each Wellbore Section

Back **Next**

Test user
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3. Click Next

AC Rules

AI/DE

New trajectory

Info Base trajectory Targets Limits **5** AC settings 6 Offset wells 7 Review

Scan method: Complete search (Min OSF) Surface rule: 80% clearance + Rsub + Roff

Confidence level (sigma): 2.7995

1. Select Planning Toolcode

Toolcode: MWD

Critical OSF: 1 Wellhead uncertainty (m): 0.3

Reference well OD (m): 0.7 Offset well OD (m): 0.7

AC in production section:

2. Enter AC rules

Back Next

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3. Click Next

Offset Wells

AI/DE

New trajectory

Info Base trajectory Targets Limits AC settings **6** Offset wells 7 Review

1. Add Offset Wells

2. Enter a Name of the Offset Well

3. Enter the Wellhead Coordinates

4. Copy-paste the MD/Inc/Az

5. Enter the Survey Program

6. Click Next

+ New trajectory

TASKS

- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕

+ Add well

- Offset 1 ✕
- Offset 2 ✕
- Offset 3 ✕
- Offset 4 ✕
- Offset 5 ✕
- Offset 6 ✕
- Offset 7 ✕
- Offset 8 ✕
- Offset 9 ✕
- Offset 10 ✕
- Offset 11 ✕
- Offset 12 ✕
- Offset 13 ✕
- Offset 14 ✕

Name

Offset 1

Wellhead

NS (m)	EW (m)	TVD (m)
150	-265	0

Stations

MD (m)	Inc (deg)	Az (deg)
0	0	0
3000	0	0

Paste MD/Inc/Az here

Start MD (m) Stop MD (m) Toolcode

Start End ION-OPT

+ Back Next

Test user test@test.a

6. Click Next

Review Task and Run

AI/DE

+ New trajectory

TASKS

- ✓ Fence Traver... X
- ✓ Fence Traver... X
- ✓ Fence Traver... X
- ✓ Fence Traver... X
- ✓ Fence Traver... X
- ✓ Fence Traver... X
- ✓ Fence Traver... X
- ✓ Fence Traver... X

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New trajectory

Info Base trajectory Targets Limits AC settings Offset wells Review

2. Save the Task

Fence Traversal

Export to JSON

G: 9.80665 m/s² B: 50000 nT Dip: 72 deg Dec: 0 deg Grid: 0 deg
Well head: N 0, E 0, MSL 0
T1: N 2000, E 200, MSL 3000, Inc 90, Az 180
Max DLS: 10 deg/30m
ESP: 1900-2000 m TVD
Section 1 Start-1000 m TVD (Max DLS: 2 deg/30m)
Section 2 1000-2000 m TVD (Max DLS: 5 deg/30m)
Section 3 2000-End m TVD (Max DLS: 10 deg/30m)
Survey program
Start-End - MWD
AC method: Complete search (Min OSF)
Surface rule: 80% clearance + R_{sub} + R_{off}
Confidence level: 2.8
Critical OSF: 1

Offset wells

Offset 1
Well head: N 150, E -265, MSL 0
...
3000 m, 0 deg, 0 deg
Start-End - ION-OPT
Offset 2
Well head: N 150, E -225, MSL 0

1. Check the Task

Back Create task

3. Click To Calculate the Task

Wait for Result

AI/DE


+ New trajectory

TASKS

- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- Fence Traversal

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Wait For Result. It can take 5-10 minutes



In Progress
Your request is being processed.
Upon its completion, you will be redirected to the results.

Review Result

+ New trajectory

TASKS

- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕
- ✓ Fence Traver... ✕

Previous Results

Test user
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AI/DE

Resulting Trajectory

MD (m)	Inc (deg)	Az (deg)	NS (m)	EW (m)	TVD (m)	DLS (deg/...
0.0	0.00	0.00	0.0	0.0	0.0	0.00
680.0	30.02	10.17	171.4	30.8	649.3	1.32
1,549.2	32.27	337.05	602.3	-21.7	1,398.6	0.59
1,926.0	53.02	353.99	848.0	-77.4	1,675.1	1.88
2,336.8	50.04	11.09	1,167.2	-64.3	1,931.9	1.00
2,849.1	46.58	13.87	1,540.7	18.1	2,272.6	0.24
3,548.1	59.86	8.29	2,088.9	123.1	2,690.4	0.60
3,994.6	90.00	180.00	2,000.0	200.0	3,000.0	10.00

Switch Plot/AC report

3D AC scan

Offset 1 Offset 2 Offset 3 Offset 4 Offset 5 Offset 6 Offset 7
Offset 8 Offset 9 Offset 10 Offset 11 Offset 12 Offset 13 Offset 14

Interactive 3D Plot

Abnormal Result

- If you entered conflicting limits (too low DLS, too narrow inclination range, etc.), AI/DE will not be able to find a solution and will produce an abnormal result as in the picture
- If you get something similar to the picture, try restarting the task with relaxed limits

