Dynamic Pages Documentation

URL to live web application: http://malenah-portal.appspot.com/

Description of the web application/site

The web application, called the M.A.L.E.N.A.H. Portal, is constructed on the Google App Engine cloud service/platform in Python.

MALENAH stands for **M**obile **A**lly for **L**GBT people, **E**nhancing, through a **N**etwork, **A**ccess to **H**ealthcare. LGBT people face barriers to healthcare access and have a host of unique health-related needs. As such, the web application/site http://malenah-portal.appspot.com serves as an administrator portal, storing information about caring and culturally competent healthcare providers who are equipped to care for LGBT people in the hopes of closing the LGBT health disparities gap.

The MALENAH portal stores information about healthcare providers. Healthcare providers (class Provider) are stored as NDB models (entities) in the NDB datastore, including physicians, dentists, pharmacists, nurses, counsellors, and others. Providers have the following properties:

Attribute of the Provider class (NDB Model)	NDB Property type [1]	Description	Form input
first_name	ndb.StringProperty()	Healthcare provider's first name	<input type="text">
last_name	ndb.StringProperty()	Healthcare provider's last name	<input type="text">
phone	ndb.StringProperty()	Healthcare provider's phone number	<input type="tel">
email	ndb.StringProperty()	Healthcare provider's email address	<input type="email">
website	ndb.StringProperty()	Healthcare provider's website url	<input type="url">
best_time	ndb.TimeProperty()	Best time to contact the healthcare provider	<input type="time">
designation	ndb.StringProperty()	The healthcare provider's designation/degree (e.g. MD, RN, Pharm.D)	<input type="radio">
service(s)	ndb.KeyProperty (repeated=True)	Service(s) offered by the healthcare provider	<input type="checkbox">
accept_new_patients	ndb.BooleanProperty()	Whether or not the healthcare provider is accepting new patients	<input type="radio">

- The datastore also stores two additional NDB models as entities: healthcare services and healthcare professional designations, both of which have a name as a StringProperty() and are associated with healthcare providers.

Attribute of the Designation class (NDB Model)	NDB Property type [1]	Description	Form input
name	ndb.StringProperty()	Name of the designation associated with a healthcare provider	<input type="text">

Attribute of the Service class (NDB Model)	NDB Property type [1]	Description	Form input
name	ndb.StringProperty()	Name of the service provided a healthcare provider	<input type="text">

Test Plan

To ensure that the web application is working properly, I used this test plan, containing 32 manual tests.

#	Type	Test Case	Input	Expected Outcome	Observed Outcome
1	Blank	Empty database. Attempt to submit the "Add Provider" form with empty fields in Google Chrome, Firefox.	Click on the submit button in the "Add Healthcare Provider" form.	HTML5 form should prompt the user to complete the required fields before form can be submitted.	As expected, the healthcare provider form does not allow submission without required fields completed. First Name First Name Last Name Last Name ! Please fill out this field.
2	Edge case	Empty database. Attempt to submit the "Add Provider" form with empty fields in Safari, where support for the "required" tag is only partial [1].	Click on the submit button in the "Add Healthcare Provider" form.	HTML5 form should prompt the user to complete the required fields before form can be submitted.	The following error messages appear, as expected: *Form Submission is Unsuccessful for the following reason(s):* *You did not enter a first name.* *You did not enter a last name.* *You did not enter a phone number.* *You did not enter an email.* *You did not enter a website.* *You did not enter a contact time.* *You did not enter whether or not new patients are being accepted.*
3	Blank	Submit empty designation	Click on the submit button in the "Add a Designation" form.	HTML5 form should prompt user to complete required field before submitting.	In the Google Chrome browser, the designation form does not allow submission due to the required attribute on the input tag. This is the correct outcome. In the Safari browser, as expected, the form submits but the following error message is displayed to the user: *Unable to add record for the following reason(s): You did not enter a designation to add.* This is also the correct outcome for this browser.
4	Blank	Submit empty service	Click on the submit button in the "Add a Service" form	HTML5 form should prompt user to complete required field before submitting.	In the Google Chrome browser, the designation form does not allow submission due to the required attribute on the input tag. This is the correct outcome. In the Safari browser, as expected, the form submits but the following error message is displayed to the user*: Unable to add record for the following reason(s): You did not enter a service to add.* This is also the correct outcome for this browser.
5	Edge	Empty database, create first (non-empty) service	Enter "Counselling" into the "Add a Service" form	Counselling service added successfully (as shown in the /view page) and appears as a radio button choice in the "Add Provider" form on form submission. No records in the Provider or Designation tables	Service is recorded as expected **Record added** You added the following record (Service): Service: Lab Services Back to Home Service now appears in the provider form ┌Designation─── ○ RN └── Services (check ☐ Lab Services ┌Currently accep
6	Edge	Empty database, create first designation	Enter "Pharm.D" into the "Add a Designation" form	Pharm.D designation service added successfully (as indicated in the /view page) and appears as a checkbox in the "Add Provider" form. No records in the Provider or Designation tables	Designation recorded as expected **You added the following record (Designation):** Designation: RN Back to Home Designation appears in the provider form as expected. Best time of day to co -- : -- -- ┌Designation─── ○ RN └── Services (check all
7	Edge Blank	Empty database, create first provider without first creating a service or a designation	first name: Kelvin last name: Watson phone: 9716786247 email: abc@abc.com website: http://abc.com best time to contact: 11:59pm designation: services: accepting patients: No	Provider successfully added as evidenced by the /view page Provider appears in Provider table on form submission, with empty cells under the Designation and Services columns.	Record successfully added as expected. **Record added** You added the following record (Healthcare Pr First Name: Kelvin Last Name: Watson Phone: 9716786247 Email: kelvincswatson@gmail.com Website: http://abc.com Best Time to Contact You: 23:59 Designation: Services: Accepting Patients: No Back to Home

#	Type	Description	Input	Expected	Actual
8	Edge Blank	Empty database, create first provider without first creating a service but having created a designation	first name: Kelvin last name: Watson phone: 9716786247 email: abc@abc.com website: http://abc.com best time to contact: 11:59pm designation: services: Counselling accepting patients: Yes	Provider successfully added as evidenced by the /view page	Provider is successfully added and does not show any associated designations, as expected. **Record added** You added the following record (Healt First Name: Kelvin Last Name: Watson Phone: 9716786247 Email: abc@abc.com Website: http://abc.com Best Time to Contact You: 23:59 Designation: Services: • Counselling Accepting Patients: Yes Back to Home
9	Edge Blank	Empty database, create first provider without first creating a designation but having created a service	first name: Kelvin last name: Watson phone: 9716786247 email: abc@abc.com website: http://abc.com best time to contact: 10:59AM designation: B.Sc services: accepting patients: No	Provider successfully added as evidenced by the /view page Provider appears in Provider table on form submission, with empty cell under the Services columns, but the "B.Sc" designation under the Designation column. B.Sc should also be in the Designations table beneath the Provider table in the view and admin pages.	Record is added as expected. **Record added** You added the following record (Healthcare P First Name: Kelvin Last Name: Watson Phone: 1234567890 Email: kelvincswatson@gmail.com Website: http://abc.com Best Time to Contact You: 10:59 Designation: B.Sc Services: Accepting Patients: No Back to Home Designations **Designation Types** B.Sc
10	Edge	Delete all services, even though they have been associated with providers	Delete all services using the Datastore Admin and refresh the /admin page	"All Records Currently in Database" provider table should still render the previously added services.	Under "All Records Currently in Database," Designation table is empty, but provider tables still contain designations. This is the desired outcome. Services / Ac P Nc • Counselling Ye Nc • Diabetes Education • Nutrition • Weight Management Nc
11	Edge	Navigate to the /view page directly.	malenah-portal.appspot.com/view	Redirects to /admin	Redirects to /admin as expected.
12	Edge	Navigate to the /edit page directly	malenah-portal.appspot.com/edit	Redirects to /admin	Redirects to /admin as expected.
13	Edge	Navigate to an invalid url e.g. malenah-portal.appspot.com/a!	malenah-portal.appspot.com/a!	Redirects to /admin page	Redirects to /admin as expected.
14	Edge	Navigate to the /admin page directly.	malenah-portal.appspot.com/admin	Correctly renders administration page with forms	Correctly renders administration page with forms
15	Basic	Duplicate designation	Add designation "MD" twice	Reject the addition of designations with the same name as a designation entity already in the database.	Unable to add record for the following reason(s): The designation you are trying to add already exists in the database.
16	Basic	Duplicate service	Add service "Counseling" twice	Reject the addition of services with the same name as a service entity already in the database.	Unable to add record for the following reason(s): The service you are trying to add already exists in the database.
17	Basic	Enter invalid URL for website	Enter "abc.abc" in the website field of the provider form.	Should reject invalid URLs, such as those with incorrect or missing protocols and/or top-level domains	The website field expects either http:// or https:// in the field and invalid inputs such as "abc.abc" are correctly rejected. abc.abc Best time of day to contact you 09:15 AM ⊘ Please enter a URL. However, as long as the protocol is provided, an invalid URL is still accepted. This is not a desired outcome. Website: http://abc
18	Basic	Enter invalid phone number	'abc-def-ghij'	Application should reject invalid phone numbers.	The application accepted an invalid phone number (a string containing non-numeric characters). This is not the desired result.

					You added the following record (Healthcare F
					First Name: Liam Last Name: Vanderbill Phone: abcdefghij Email: L@Vanderbill.org Website: http://LiamVanderbill.org Best Time to Contact You: 11:00 Designation: MD Services: • Weight Management Accepting Patients: Yes Back to Home
19	Blank Basic	Enter invalid email	"helena@bolton"	Application should reject invalid emails	The application accepted an invalid email address missing a top-level domain. This is not the desired result. **Record added** You added the following record (Healthcare First Name: Helena Last Name: Bolton Phone: 1234567890 Email: helena@bolton Website: http://something Best Time to Contact You: 07:00 Designation: MD Services: • Diabetes Education Accepting Patients: Yes Back to Home
20	Blank	Submit "Add a Provider" form with missing first name in Chrome and Safari. ("required" attribute is not supported in Safari)	Empty form field	Application should either reject the form submission (Chrome) or display an error message (Safari).	In the Google Chrome browser, the "required" attribute in the input tag correctly disallows form submission without first entering input into the form field. **First Name** First Name **Last Name** Watson ! Please fill out this field. In the Safari browser, the correct error message is displayed: *Unable to add record for the following reason(s): You did not enter a first name.*
21	Blank	Submit "Add a Provider" form with missing last name. ("required" attribute is not supported in Safari)	Empty form field	Application should either reject the form submission (Chrome) or display an error message (Safari).	In the Chrome browser, form submission is rejected due to the "required" attribute for the input tag, as expected: **Last Name** Last Name **Phone** 124545790 ! Please fill out this field. In the Safari browser, the result is the following error message, as expected: *Unable to add record for the following reason(s): You did not enter a first name.*
22	Blank	Submit "Add a Provider" form with missing phone. ("required" attribute is not supported in Safari)	Empty form field	Application should either reject the form submission (Chrome) or display an error message (Safari).	In the Chrome browser, form submission is rejected due to the "required" attribute for the input tag, as expected: **Phone** 1234567890 **Email** you@exam ! Please fill out this field. In the Safari browser, the result is the following error message, as expected: *Unable to add record for the following reason(s): You did not enter a phone number.*
23	Blank	Submit "Add a Provider" form with missing email. ("required" attribute is not supported in Safari)	Empty form field	Application should either reject the form submission (Chrome) or display an error message (Safari).	In the Chrome browser, form submission is rejected due to the "required" attribute for the input tag, as expected: **Email** you@example.com **Website URL** http:// ! Please fill out this field. Unable to add record for the following reason(s): You did not enter an email.
24	Blank	Submit "Add a Provider" form with missing designation.	Submit provider form with empty designation field.	Application should allow submission	The form is submitted successfully, as expected, since designation is not a required form field:

					First Name: Susan
					Last Name: Wong
					Phone: 3427891237
					Email: susan@susanwong.com
					Website: http://susan.wong.com
					Best Time to Contact You: 12:59
					Designation:
					Services: • Lab Services
					Accepting Patients: No
					Back to Home

#	Type				
25	Blank	Submit "Add a Provider" form without checking off services(s).	Submit provider form with empty service field.	Form should still be successfully submitted.	The form is submitted successfully, as expected, since service(s) is not a required form field: **Record added** **You added the following record (Healthcar** First Name: Matthew Last Name: Fields Phone: 1234567890 Email: matt@matthew.com Website: http://matthewfields.org Best Time to Contact You: 14:00 Designation: RD Services: Accepting Patients: Yes Back to Home
26	Basic Blank	Entering only space characters into the text input fields.	Submit only space characters into the text input fields.	Should not allow form submission.	Fields containing only whitespace characters are correctly rejected, and the user is prompted to provide non-whitespace input, as indicated by the following error: Unable to add record for the following reason(s): You did not enter a first name. You did not enter a last name. You did not enter a phone number.
27	Basic	Illegal characters in any of the text fields (first and last names, phone, url, email etc)	Submit non-numeric characters to the phone number and/or website field(s).	Should not allow form submission, or display error message to user.	Form submission was allowed, but this is not the desired result. Notice the invalid characters in the email and website fields. **You added the following record (Health** First Name: Kelvin Last Name: Watson Phone: @@@ Email: you@example.com Website: http://abc@abc.com Best Time to Contact You: 12:59 Designation: B.Sc Services: • Lab Services Accepting Patients: No Back to Home
28	Basic	Edit provider with no associated services	Click on "Edit" next to a provider with no associated services.	Edit form should show no checked services.	Edit Kelvin Watson 1234567890 kelvincswatson@gmail.com http://abc.com 10:59 AM B.Sc No **Edit Record** First Name: Kelvin Last Name: Watson Phone: 1234567890 Email: kelvincswatson@gmail.com Website: http://abc.com Best Time to Contact You: 10:59 AM Designation: ⦿B.Sc ○MD ○Pharm.D ○RD ○RN Services: ☐Diabetes Education ☐Lab Services ☐Nutrition ☐Psychiatry ☐Weight Management Accepting Patients: ○Yes ⦿No Update [Update Record] **You updated the following record (Healthcare** First Name: Kelvin Last Name: Watson Phone: 1234567890 Email: kelvincswatson@gmail.com Website: http://abc.com Best Time to Contact You: 10:59 AM Designation: B.Sc Services: • Nutrition • Psychiatry Accepting Patients: No Back to Home
29	Basic	Edit provider with no associated designation.	Click on "Edit" next to a provider with no associated designation.	Edit form should show no checked designation.	Edit Angie C. Prescott 1234567890 angiec@prescott.com http://angiecprescott.com 07:00 AM None • Psychiatry No Because the provider had no associated designations prior to clicking "Edit,", the edit form correctly shows

					the designation field with no prepopulated radio buttons.
					Edit Record First Name: Angie C. Last Name: Prescott Phone: 1234567890 Email: angiec@prescott.com Website: http://angiecprescott.com Best Time to Contact You: 07:00 AM Designation: ○ B.Sc ○ MD ○ Pharm.D ○ RD ○ RN Services: ☐ Diabetes Education ☐ Lab Services ☐ Nutrition ☑ Psychiatry ☐ Weight Management Accepting Patients: ○ Yes ◉ No Update [Update Record] Last Accessed: 2016-01-15 18:49:18 Checking off Pharm.D as a designation, the form submits successfully and the record is correctly updated. **Record updated** You updated the following record (Healthca First Name: Angie C. Last Name: Prescott Phone: 1234567890 Email: angiec@prescott.com Website: http://angiecprescott.com Best Time to Contact You: 07:00 AM Designation: Pharm.D Services: • Psychiatry Accepting Patients: No Back to Home
	Basic	Edit provider's designation	In the Edit form, select a different designation than the original designation.	Edit form should be successfully submitted and database record successfully updated.	Edit Susan Wong 3427891237 susan@susanwong.com http://susan.wong.com 12:59 PM RN • Lab Services No In the Edit form, "RN" is pre-populated as expected. **Edit Record** First Name: Susan Last Name: Wong Phone: 3427891237 Email: susan@susanwong.com Website: http://susan.wong.com Best Time to Contact You: 12:59 PM Designation: ○ B.Sc ○ MD ○ Pharm.D ○ RD ◉ RN Services: ☐ Diabetes Education ☑ Lab Services ☐ Nutrition ☐ Psychiatry ☐ Weight Management Accepting Patients: ○ Yes ◉ No Update [Update Record] On changing the designation from RN to RD, the /view page shows the record has been successfully updated. **Record updated** You updated the following record (Healthca First Name: Susan Last Name: Wong Phone: 3427891237 Email: susan@susanwong.com Website: http://susan.wong.com Best Time to Contact You: 12:59 PM Designation: RD Services: • Lab Services Accepting Patients: No Back to Home
30	Basic	Edit provider's services (add an additional service)	In the Edit form, select an additional service.	Edit form should be successfully submitted and database record successfully updated.	Edit Edward Watson 5031234567 btest@bwtest.com http://abc1.com 11:59 PM RN • Nutrition • Psychiatry In the edit form, Nutrition and Psychiatry is prepopulated, as expected.

					Edit Record

Edit Record

First Name: Edward
Last Name: Watson
Phone: 5031234567
Email: btest@bwtest.com
Website: http://abc1.com
Best Time to Contact You: 11:59 PM
Designation:
- B.Sc
- MD
- Pharm.D
- RD
- ● RN

Services:
- Diabetes Education
- Lab Services
- ☑ Nutrition
- ☑ Psychiatry
- Weight Management

Accepting Patients:
- ● Yes
- No

Update [Update Record]
Last Accessed: 2016-01-15 18:33:31

Checking off an additional service adds another service to the provider, which is correctly submitted as expected.

Record updated

You updated the following record (Healthca

First Name:	Edward
Last Name:	Watson
Phone:	5031234567
Email:	btest@bwtest.com
Website:	http://abc1.com
Best Time to Contact You:	11:59 PM
Designation:	RN
Services:	• Diabetes Education • Nutrition • Psychiatry
Accepting Patients:	Yes

Back to Home

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31 Basic Edit provider's services (remove a service)

In the Edit form, unselect a service.

Edit form should be successfully submitted and database record successfully updated.

Edit Edward Watson 5031234567 btest@bwtest.com http://abc1.com 11:59 PM RN • Diabetes Education • Nutrition • Psychiatry

The edit form correctly prepopulates the three services associated with the provider.

Edit Record

First Name: Edward
Last Name: Watson
Phone: 5031234567
Email: btest@bwtest.com
Website: http://abc1.com
Best Time to Contact You: 11:59 PM
Designation:
- B.Sc
- MD
- Pharm.D
- RD
- ● RN

Services:
- ☑ Diabetes Education
- Lab Services
- ☑ Nutrition
- ☑ Psychiatry
- Weight Management

Accepting Patients:
- ● Yes
- No

Update [Update Record]

Removing Diabetes Education correctly results in the service being removed.

Record updated

You updated the following record (Hea

First Name:	Edward
Last Name:	Watson
Phone:	5031234567
Email:	btest@bwtest.com
Website:	http://abc1.com
Best Time to Contact You:	11:59 PM
Designation:	RN
Services:	• Nutrition • Psychiatry
Accepting Patients:	Yes

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32 Basic Edit whether or not provider is accepting patients in a provider that did not accept patients

Click on "Edit" next to the provider. Edit the response to "Yes" under "Accepting Patients," then click on the "Update Record" button.

If the provider's did not originally accept patients, the "No" radio button should be checked off in the edit page. Checking off "Yes" should correctly edit the record.

Edit Jason Chu 9716786247 kelvincswatson@gmail.com http://abc.com 11:00 AM B.Sc • Nutrition No

In the edit form, the "No" next to Accepting Patients is correctly checked off.

Checking off the record to "Yes" under "Accepting Patients" correctly changes the record.

Record updated

You updated the following record (Healthcare

First Name:	Jason
Last Name:	Chu
Phone:	9716786247
Email:	kelvincswatson@gmail.com
Website:	http://abc.com
Best Time to Contact You:	11:00 AM
Designation:	B.Sc
Services:	• Diabetes Education • Nutrition • Weight Management
Accepting Patients:	Yes

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Results of Executing Test Plan

The process of documenting the test plan initially revealed a number of bugs, most of which have now been fixed. These bugs were mostly due to inadequate error checking, and including the following:

Bugs	Explanation of Fixes
Duplicate entries of designations and services did not get caught	FIXED On an attempt to insert a designation or service entity into the database, a check is performed by retrieving all designations or services and comparing the names of all queried entities with that of the user's input. If an entity is identified with the same name as the name entered on user input, the database insertion is rejected.
Routing bug - navigating directly to /view or /edit does not automatically redirect to the /admin page	FIXED By fixing the app.yaml routing url's and fixing the order of the handlers in main.py, direct navigation to /view, /edit, or /(any character(s)) will result in redirection to /admin so that the AdminHandler can render the admin page.
Routing bug – handlers placed in the wrong order resulting in the admin page always being rendered instead of the edit page.	FIXED The default route '.*' should be the listed last as the application tries to match the routes in order. [5]
Missing input validation for empty form input fields. Safari allows forms to be posted/submitted even when input fields containing the "required" attribute are left empty	FIXED If the Safari browser is used, empty form fields are now detected and a corresponding error message is displayed. In the Chrome browser, the "required" attribute of the input tags correctly detect empty form fields.
Missing return statement in post and get methods when form input invalid	FIXED Adding a return statement in the post and get methods when form input is invalid correctly prevents additional calls to get and post on error.

Explanation of Failures
There are several outstanding bugs, which include the following:
1. The application currently does not parse URL's, and accepts invalid URL's with missing top-level domains and stores them in the database as strings.
   - In order to fix this bug, I could use regular expressions. An easier way would need to import a library such as the validator library, urlparse from urlparse, or the URLValidator from django.core.validators in Python to parse URL's. [6] [7]
2. The application currently does not parse phone numbers. Instead, it accepts invalid phone numbers and stores them in the database as strings..
   - In order to fix this bug, I would need to import a library such as phonenumbers 7.2.3 in Python to parse phone numbers. [8]
3. The application currently does not parse email addresses, and accepts invalid email addresses and stores them in the database as strings.
   - In order to fix this bug, I would need to import a library such as validate_email 1.3 in Python to parse phone numbers. The Python validators library is also able to validate emails. [6] [9]

Discussion of Templating to Display Data
Specifically, using Jinja templating to implement logic, render variables, access properties. For logic, I used the following control structures: the *for* loop, the *if/elif/else* statements. I also used Jinja for comparison of strings for equality, for example, {% if s.name == t.name %} compares two strings.

By using the *extends* tag, I was able to extend an html template called index.html to all of my other page templates. For instance, in my admin.html template, I used the statement {% include index.html' %} to prevent the need to duplicate html tags and jinja expressions common among the pages, such as <html>, <head>, <title> <body> or {{title}}.

Using the *extends* tag also allowed me to override blocks within the index.html template as necessary. For instance, index.html contains a content *block* {% block content %} as well as an "all database data" block {% block all_database_data %}. Only the admin and view pages override the all_database_data block. All pages override the content block.

Finally, I used filters to pipe expressions into Jinja's built-in filters, including *length()* to get the number of items in a list, and *string()* to convert a string to Unicode.

Reflection (*Changes I would make if I had to do it over again*)
I would design my application more thoroughly prior to coding to reduce the amount of code duplication. For instance, the get() and post() methods in the view.py ViewHandler contains many lines of code in common. This indicates that incorporating an appropriate object-oriented design pattern could have resulted in much cleaner code.

Some features that I missed were text validation, including stripping of leading and trailing white space. In addition, there should be stricter input validation of phone numbers <input type="tel"> and emails <input type="email"> records as explained in the outstanding bugs in the application. Importing of additional libraries to valid emails, phone numbers and website URL's can sufficiently address these issues.

Thinking ahead to the mobile application portion of the course, if I had to do this assignment over again, I would have made the code more adaptable/flexible to creating a sort of backend API to respond to requests from a mobile application.

Sources
[1] https://cloud.google.com/appengine/docs/python/ndb/db_to_ndb
[2] http://caniuse.com/#feat=form-validation
[3] http://jinja.pocoo.org/docs/dev/
[4] http://jinja.pocoo.org/docs/dev/templates/
[5] https://webapp-improved.appspot.com/guide/routing.html
[6] https://validators.readthedocs.org/en/latest/

[7] https://docs.python.org/2/library/urlparse.html
[8] https://pypi.python.org/pypi/phonenumbers
[9] https://pypi.python.org/pypi/validate_email