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BIOLOGICAL DATABASE

(BIT2001)

J-COMPONENT

SKIN CANCER DATABASE

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Submitted to:

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Contents:

CHAPTER-1: ABSTRACT

Skin cancer is the most common type of cancer. The main types of skin cancer are squamous cell carcinoma, basal cell carcinoma, and melanoma. Melanoma is much less common than the other types but much more likely to invade nearby tissue and spread to other parts of the body. Most deaths from skin cancer are caused by melanoma. This database attempts to simplify the approach to look for various skin cancer causing protein and gene sequences.

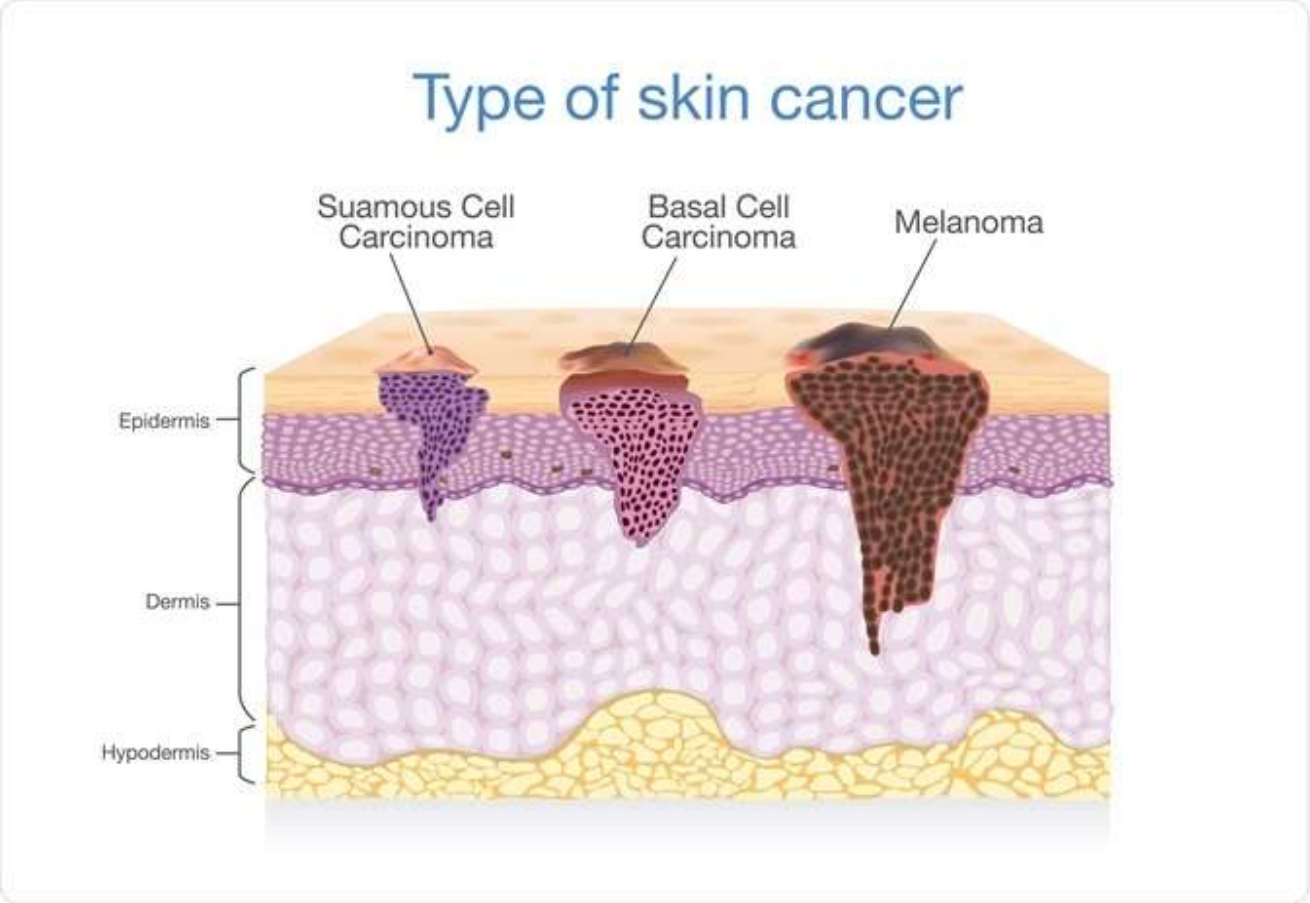


Fig. 1: Types of Skin Cancer
Source: DermaSensors: The Future of Skin Cancer Detection

CHAPTER-2: OVERVIEW OF METHODOLOGY

1. In this project, sequences will be imported from the Uniprot database. The genes are downloaded from the Cosmic Cancer database from the skin section.

2. We will be using specific queries to navigate through the database. The database is created in MySQL by importing the CSV files that were downloaded from the COSMIC cancer database and various other databases and the database is hosted via Xampp server with the PhpMyAdmin host.

3. Making a user-friendly website where the user just needs to input the Protein name / ID it will be confirmed whether that particular protein is cancerous or not.

CHAPTER-3: LITERATURE REVIEW

1. ***Russell W. Jenkins, David E. Fisher, Treatment of Advanced Melanoma in 2020 and Beyond, Journal of Investigative Dermatology, Volume 141, Issue 1, 2021,***

The melanoma field has seen an unprecedented set of clinical advances over the past decade. Therapeutic efficacy for advanced or metastatic melanoma went from being one of the most poorly responsive to one of the more responsive. Perhaps most strikingly, the advances that transformed management of the disease are based upon modern mechanism-based therapeutic strategies. The targeted approaches that primarily suppress the BRAF oncoprotein pathway have a high predictability of efficacy although less optimal depth or durability of response. Immunotherapy is primarily based on blockade of one or two immune checkpoints and has a lower predictability of response but higher fractions of durable remissions. This article reviews the clinical progress in management of advanced melanoma and also discusses the impact of the same therapies on earlier stage disease, where the agents have shown significant promise in treating respectable but high-risk clinical scenarios. Collectively, the progress in melanoma therapeutics has transformed the standard of care for patients, informed new approaches that are increasingly utilized for treatment of other malignancies, and suggest novel strategies to further boost efficacy for the many patients not yet receiving optimal benefit from these approaches.

2. ***Cutaneous Squamous Cell Carcinoma: From Pathophysiology to Novel Therapeutic Approaches by Luca Fania 1,*,†,Dario Didona 2,†ORCID,Francesca Romana Di Pietro 1,Sofia Verkhovskaia 1,Roberto Morese 1,Giovanni Paolino 3,Michele Donati 4,5,Francesca Ricci 1,Valeria Coco 6,Francesco Ricci 1,Eleonora Candi 1,7,Damiano Abeni 1 and Elena Dellambra***

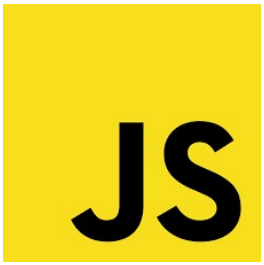
Cutaneous squamous cell carcinoma (cSCC), a non-melanoma skin cancer, is a keratinocyte carcinoma representing one of the most common cancers with a increasing incidence. cSCC could be in situ (e.g., Bowen's disease) or an invasive form. A significant cSCC risk factor is advanced age, together with cumulative sun exposure, fair skin, prolonged immunosuppression, and previous skin cancer diagnoses. Although most cSCCs can be treated by surgery, a fraction of them recur and metastasize, leading to death. cSCC could arise de novo or be the result of a progression of the actinic keratosis, an in situ carcinoma. The multistage process of cSCC development and progression is characterized by mutations in the genes involved in epidermal homeostasis and by several alterations, such as epigenetic modifications, viral infections, or microenvironmental changes. Thus, cSCC development is a gradual process with several histological- and pathological-defined stages. Dermoscopy and reflectance confocal microscopy enhanced the diagnostic accuracy of cSCC. Surgical excision is the first-line treatment for invasive cSCC. Moreover, radiotherapy may be considered as a primary treatment in patients not candidates for surgery. Extensive studies of cSCC pathogenic mechanisms identified several pharmaceutical targets and allowed the development of new systemic therapies, including immunotherapy with immune checkpoint inhibitors, such as Cemiplimab, and epidermal growth factor receptor inhibitors for metastatic and locally advanced cSCC. Furthermore, the implementation of prevention measures has been useful in-patient management.

3. ***McDaniel B, Badri T, Steele RB. Basal Cell Carcinoma. [Updated 2021 Sep 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan***

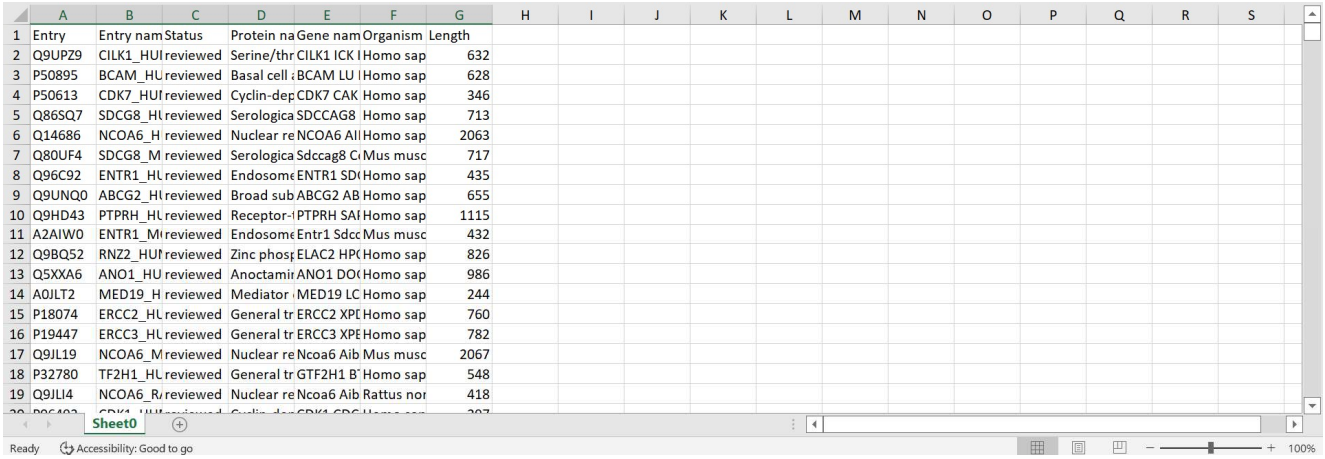
Basal cell carcinoma (BCC), previously known as basal cell epithelioma, is the most common cancer in Humans. BCC mostly arises on sundamaged skin and rarely develops on the mucous membranes or palms and soles. Basal cell carcinoma is usually a slow-growing tumor for which metastases are rare. Although rarely fatal, BCC can be highly destructive and disfigure local tissues when treatment is inadequate or delayed. On clinical examination, BCC usually appears as flesh- or pink colored, pearly papules with overlying ulceration or telangiectatic vessels. BCC occurs on the head or neck in the majority of cases, but can involve the trunk and extremities. More than 26 different subtypes of BCC appear in the literature, but the more common, distinctive, clinicopathologic types include: nodular, micronodular, superficial, morpheaform, infiltrative and fibroepithelial (also known as fibroepithelioma of Pinkus). Combinations of these types can occur as well. The majority of BCCs are amelanotic, but variable amounts of melanin may be present within these tumors. The current mainstay of BCC treatment involves surgical modalities such as excision, electrodesiccation and curettage (EDC), cryosurgery, and Mohs micrographic surgery. Such methods are typically reserved for localized BCC and offer high 5-year cure rates, generally over 95%

CHAPTER-4: SOFTWARE REQUIREMENTS

1. MySQL
2. HTML
3. CSS
4. JavaScript
5. Bootstrap
6. Xampp



CHAPTER-5: DATASET SNIPPETS

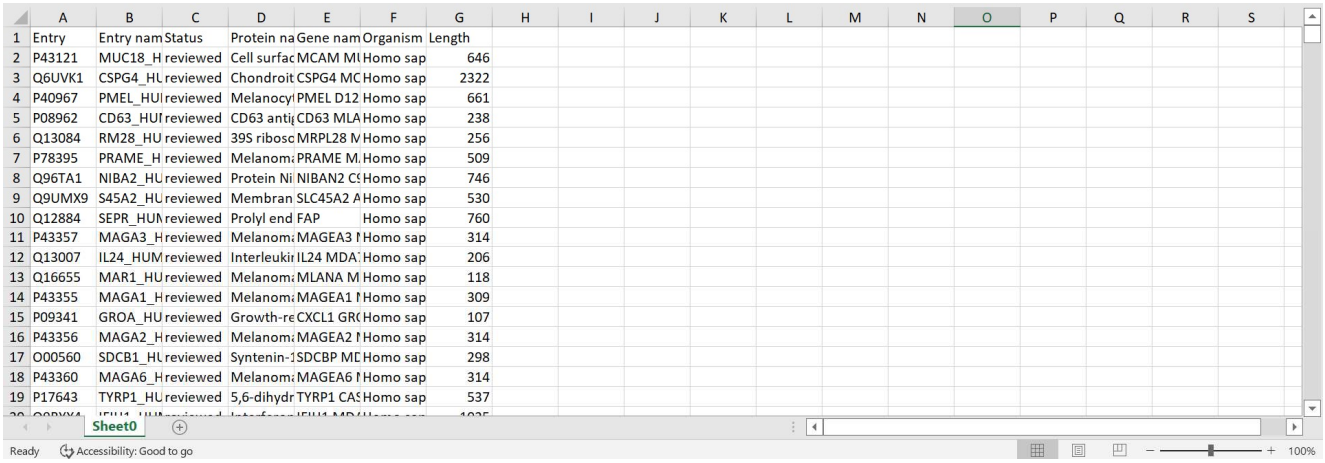


	A	B	C	D	E	F	G
1	Entry	Entry nam	Status	Protein na	Gene nam	Organism	Length
2	Q9UPZ9	CILK1_HUI	reviewed	Serine/thr	CILK1 ICK I	Homo sap	632
3	P50895	BCAM_HU	reviewed	Basal cell a	BCAM LU I	Homo sap	628
4	P50613	CDK7_HUI	reviewed	Cyclin-dep	CDK7 CAK	Homo sap	346
5	Q86SQ7	SDCG8_HU	reviewed	Serologica	SDCCAG8	Homo sap	713
6	Q14686	NCOA6_H	reviewed	Nuclear re	NCOA6 AI	Homo sap	2063
7	Q80UF4	SDCG8_M	reviewed	Serologica	Sdccag8 C	Mus musc	717
8	Q96C92	ENTR1_HU	reviewed	Endosome	ENTR1 SD(	Homo sap	435
9	Q9UNQ0	ABCG2_HU	reviewed	Broad sub	ABCG2 AB	Homo sap	655
10	Q9HD43	PTPRH_HU	reviewed	Receptor-t	PTPRH SAI	Homo sap	1115
11	A2AIW0	ENTR1_MI	reviewed	Endosome	Entr1 Sdcc	Mus musc	432
12	Q9BQ52	RNZ2_HUI	reviewed	Zinc phosp	ELAC2 HP(	Homo sap	826
13	Q5XXA6	ANO1_HU	reviewed	Anoctamin	ANO1 DO(	Homo sap	986
14	A0JLT2	MED19_H	reviewed	Mediator	MED19 LC	Homo sap	244
15	P18074	ERCC2_HU	reviewed	General tr	ERCC2 XPI	Homo sap	760
16	P19447	ERCC3_HU	reviewed	General tr	ERCC3 XPI	Homo sap	782
17	Q9JL19	NCOA6_M	reviewed	Nuclear re	Ncoa6 Aib	Mus musc	2067
18	P32780	TF2H1_HU	reviewed	General tr	GTF2H1 B	Homo sap	548
19	Q9JLI4	NCOA6_R	reviewed	Nuclear re	Ncoa6 Aib	Rattus nor	418

Sheet0

Ready Accessibility: Good to go 100%

Fig. 2: Squamous Cell Dataset



	A	B	C	D	E	F	G
1	Entry	Entry nam	Status	Protein na	Gene nam	Organism	Length
2	P43121	MUC18_H	reviewed	Cell surfac	MCAM MI	Homo sap	646
3	Q6UVK1	CSPG4_HU	reviewed	Chondroit	CSPG4 MC	Homo sap	2322
4	P40967	PMEL_HUI	reviewed	Melanocyt	PMEL D12	Homo sap	661
5	P08962	CD63_HUI	reviewed	CD63 antig	CD63 MLA	Homo sap	238
6	Q13084	RM28_HU	reviewed	39S ribosc	MRPL28 M	Homo sap	256
7	P78395	PRAME_H	reviewed	Melanoma	PRAME M.	Homo sap	509
8	Q96TA1	NIBA2_HU	reviewed	Protein Ni	NIBAN2 C	Homo sap	746
9	Q9UMX9	S45A2_HU	reviewed	Membran	SLC45A2 A	Homo sap	530
10	Q12884	SEPR_HUM	reviewed	Prolyl end	FAP	Homo sap	760
11	P43357	MAGA3_H	reviewed	Melanoma	MAGEA3 I	Homo sap	314
12	Q13007	IL24_HUM	reviewed	Interleukin	IL24 MDA	Homo sap	206
13	Q16655	MAR1_HU	reviewed	Melanoma	MLANA M	Homo sap	118
14	P43355	MAGA1_H	reviewed	Melanoma	MAGEA1 I	Homo sap	309
15	P09341	GROA_HU	reviewed	Growth-re	CXCL1 GR(	Homo sap	107
16	P43356	MAGA2_H	reviewed	Melanoma	MAGEA2 I	Homo sap	314
17	O00560	SDCB1_HU	reviewed	Syntenin-1	SDCBP MI	Homo sap	298
18	P43360	MAGA6_H	reviewed	Melanoma	MAGEA6 I	Homo sap	314
19	P17643	TYRP1_HU	reviewed	5,6-dihydr	TYRP1 CA	Homo sap	537

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Ready Accessibility: Good to go 100%

Fig. 3: Melanoma Dataset

CHAPTER-6: FRONTEND SNIPPETS

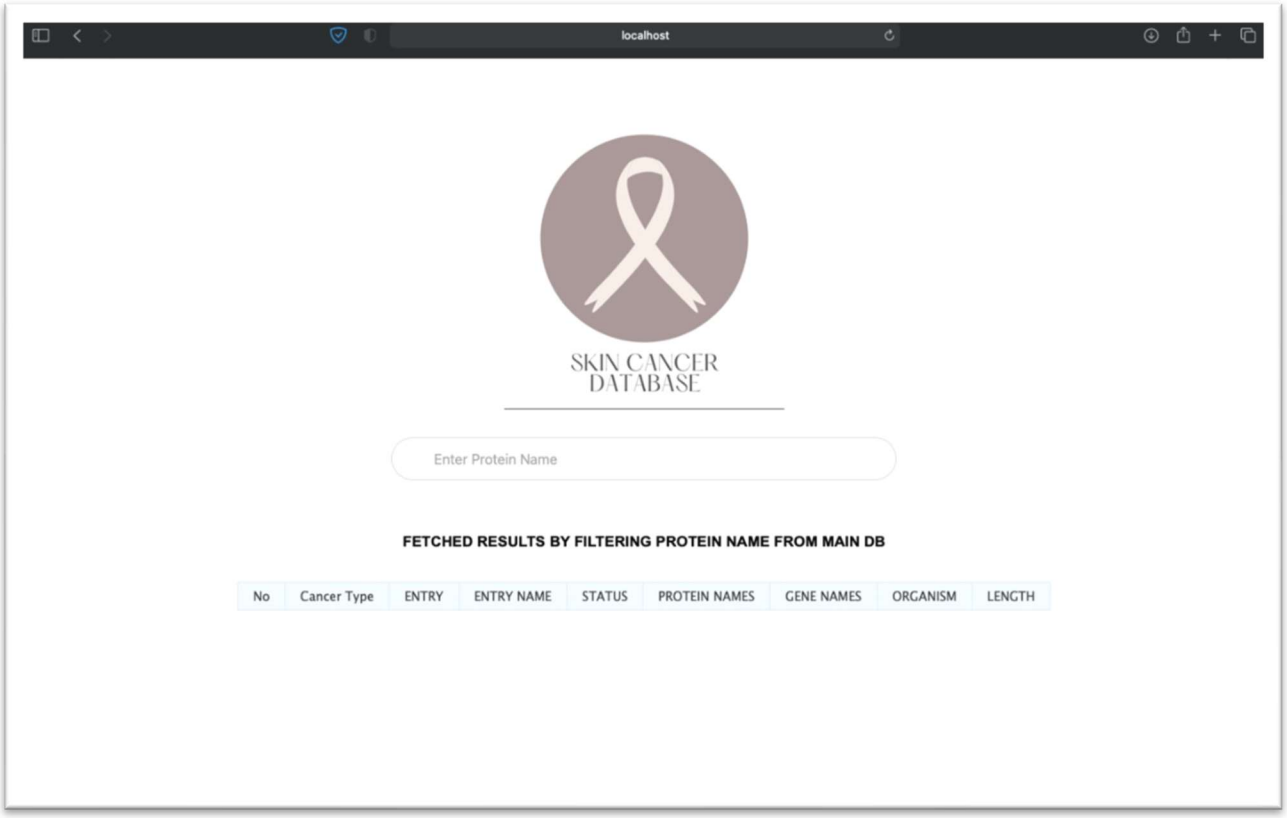


Fig. 4: Frontend Snippets

CHAPTER-7: BACKEND SNIPPETS

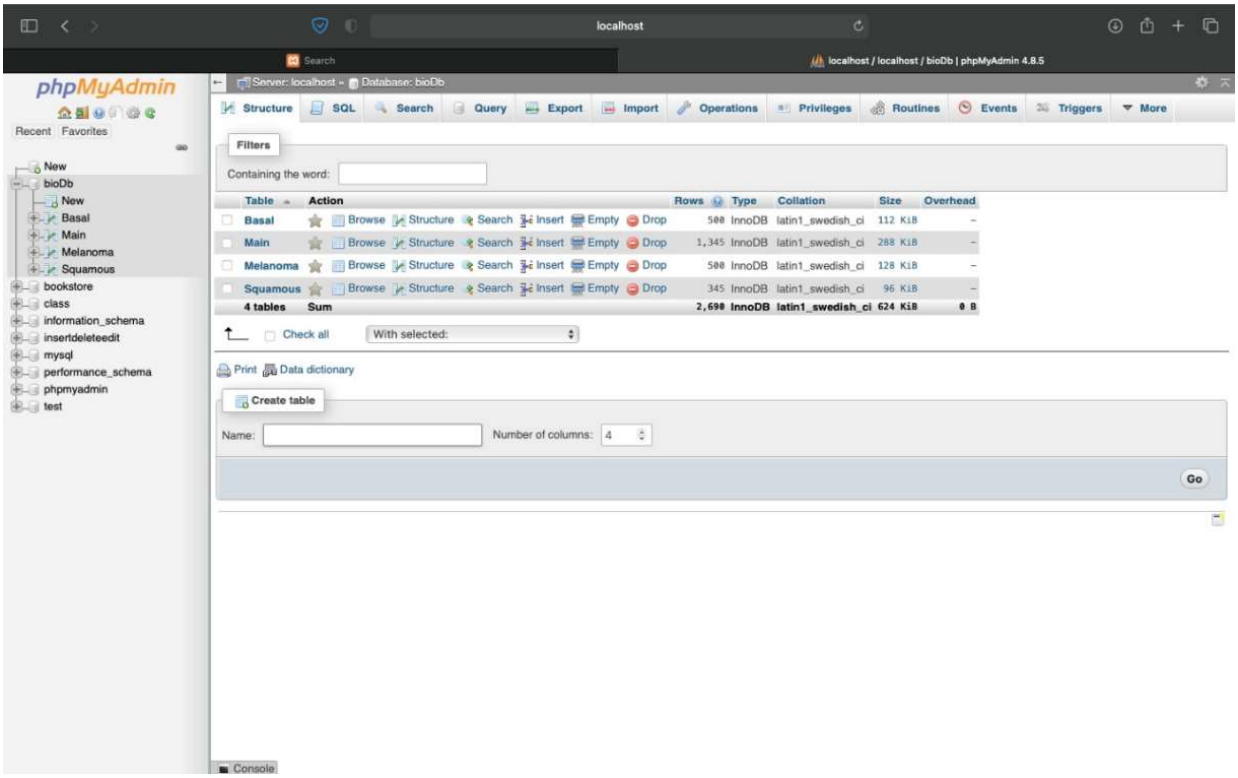


Fig. 5: PHP MyAdmin

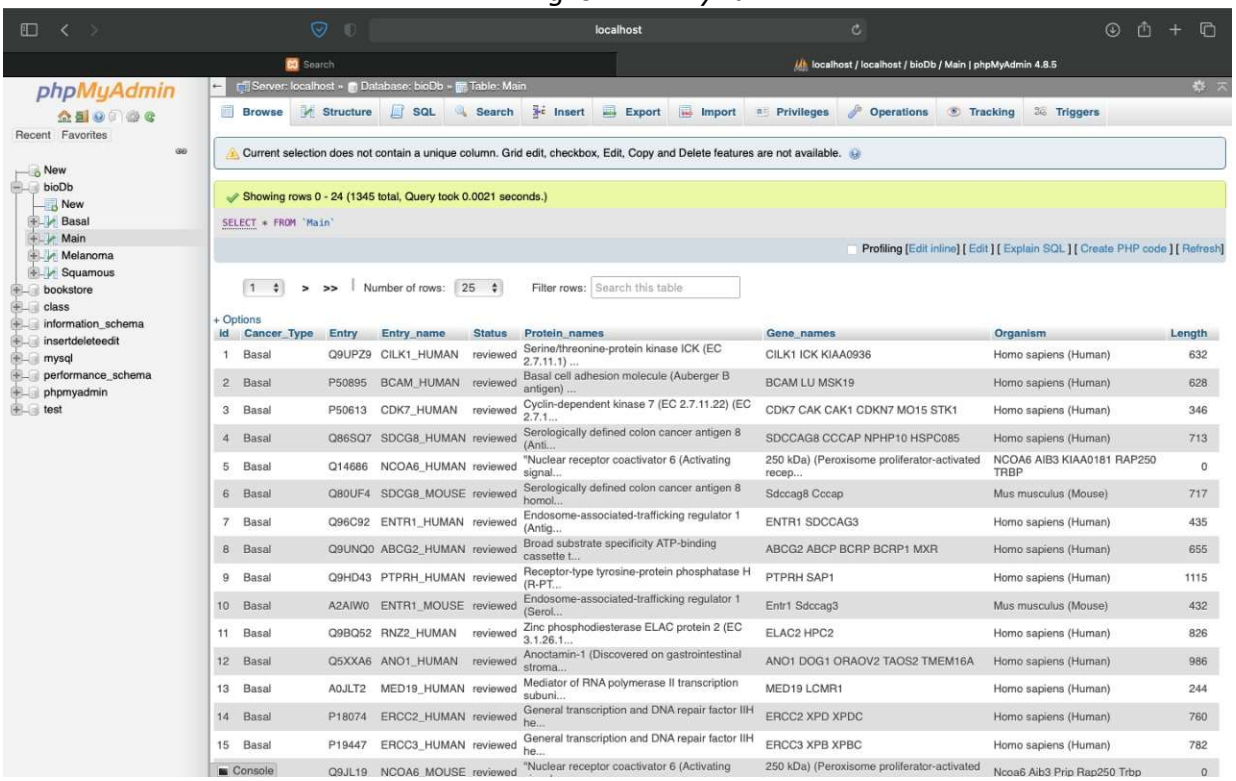


Fig. 6: MySQL Table

CHAPTER-8: CODE

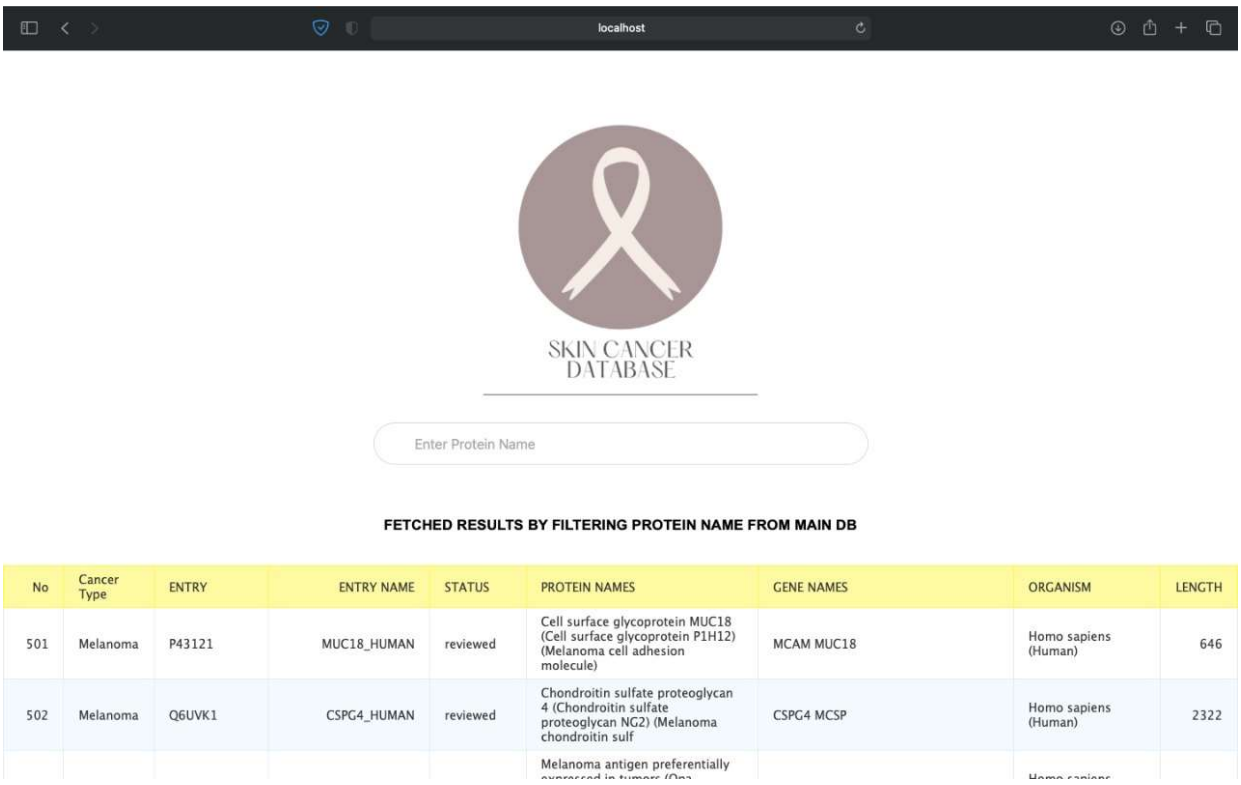
```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Search</title>
   <link rel="stylesheet" href="css/index.css">
   <title>This data was fetched from the <?php echo $dbname ?> database</title>
   <style type="text/css">
/*       body {
            font-size: 15px;
            color: #343d44;
            font-family: "segoe-ui", "open-sans", tahoma, arial;
            padding: 0;
            margin: 0;
        }*/

        table {
            margin: auto;
            font-family: "Lucida Sans Unicode", "Lucida Grande", "Segoe Ui";
            font-size: 12px;
        }

        h1 {
            margin: 25px auto 0;
            text-align: center;
            text-transform: uppercase;
            font-size: 17px;
        }
```

```
table td {
    transition: all .5s;
}

/* Table */
.data-table {
    border-collapse: collapse;
    font-size: 14px;
    min-width: 537px;
}

.data-table th,
.data-table td {
    border: 1px solid #e1edff;
    padding: 7px 17px;
}

.data-table caption {
    margin: 7px;
}

/* Table Header */
.data-table thead th {
    background-color: #508abb;
    color: #FFFFFF;
    border-color: #6ea1cc !important;
    text-transform: uppercase;
}

/* Table Body */
.data-table tbody td {
```

```
        color: #353535;
      }

      .data-table tbody td:first-child,
      .data-table tbody td:nth-child(4),
      .data-table tbody td:last-child {
        text-align: right;
      }

      .data-table tbody tr:nth-child(odd) td {
        background-color: #f4fbff;
      }

      .data-table tbody tr:hover td {
        background-color: #ffffa2;
        border-color: #ffff0f;

      }

      .data-table tfoot th:first-child {
        text-align: left;
      }

      .data-table tbody td:empty {
        background-color: #ffcccc;
      }
    </style>
</head>
<body>
    <center>
    <div class="center-me">
      <div class="logo">
```

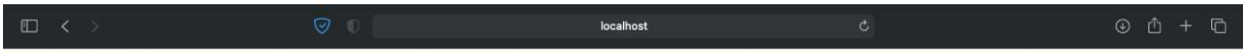
```
        <img src="images/logo1.png" id="logo">
      </div>
        <form action="" method="post" action="fetch.php">
          <div class="search">
            <input class="search-box" type="text" name="term" placeholder="Enter Protein Name
">
            <!-- <img src="images/search-icon.png" id="search-icon">
            <img src="images/mic-icon.png" id="mic-icon"> -->
            <!-- <input type="submit" value="Submit" /> -->

          </div>
        </form>

   </div>
</center>

<br><br>
<h1>Fetched Results By Filtering Protein Name from <?php echo $dbname ?> DB</h1>
<br><br>
<table class="data-table">
<tr>
<td>No</td>
<td>Cancer Type</td>
<td>ENTRY</td>
<td>ENTRY NAME</td>
<td>STATUS</td>
<td>PROTEIN NAMES</td>
<td>GENE NAMES</td>
<td>ORGANISM</td>
<td>LENGTH</td>

</tr>
```

CHAPTER-9: OUTPUT SCREENSHOTS



No	Cancer Type	ENTRY	ENTRY NAME	STATUS	PROTEIN NAMES	GENE NAMES	ORGANISM	LENGTH
501	Melanoma	P43121	MUC18_HUMAN	reviewed	Cell surface glycoprotein MUC18 (Cell surface glycoprotein P1H12) (Melanoma cell adhesion molecule)	MCAM MUC18	Homo sapiens (Human)	646
502	Melanoma	Q6UVK1	CSPG4_HUMAN	reviewed	Chondroitin sulfate proteoglycan 4 (Chondroitin sulfate proteoglycan NG2) (Melanoma chondroitin sulf	CSPG4 MCSP	Homo sapiens (Human)	2322
					Melanoma antigen preferentially			

Fig. 7: Searching the database



No	Cancer Type	ENTRY	ENTRY NAME	STATUS	PROTEIN NAMES	GENE NAMES	ORGANISM	LENGTH
501	Melanoma	P43121	MUC18_HUMAN	reviewed	Cell surface glycoprotein MUC18 (Cell surface glycoprotein P1H12) (Melanoma cell adhesion molecule)	MCAM MUC18	Homo sapiens (Human)	646
502	Melanoma	Q6UVK1	CSPG4_HUMAN	reviewed	Chondroitin sulfate proteoglycan 4 (Chondroitin sulfate proteoglycan NG2) (Melanoma chondroitin sulf	CSPG4 MCSP	Homo sapiens (Human)	2322
506	Melanoma	P78395	PRAME_HUMAN	reviewed	Melanoma antigen preferentially expressed in tumors (Opa-interacting protein 4) (OIP-4) (Preferentia	PRAME MAPE OIP4	Homo sapiens (Human)	509
507	Melanoma	Q96TA1	NIBA2_HUMAN	reviewed	Protein Niban 2 (Meg-3) (Melanoma invasion by ERK) (MINERVA) (Niban-like protein 1) (Protein FAM129B	NIBAN2 C9orf88 FAM129B	Homo sapiens (Human)	746
508	Melanoma	Q9UMX9	S45A2_HUMAN	reviewed	Membrane-associated transporter protein (Melanoma antigen AIM1) (Protein AIM-1) (Solute carrier fami	SLC45A2 AIM1 MATP	Homo sapiens (Human)	530
509	Melanoma	Q12884	SEPR_HUMAN	reviewed	"Prolyl endopeptidase FAP (EC 3.4.21.26) (170 kDa melanoma membrane-bound gelatinase) (Dipeptidyl pe	soluble form (APCE) (EC 3.4.14.5) (EC 3.4.21.-) (EC 3.4.21.26)]"	FAP	0
510	Melanoma	P43357	MAGA3_HUMAN	reviewed	Melanoma-associated antigen 3 (Antigen MZ2-D) (Cancer/testis antigen 1.3) (CT1.3) (MAGE-3 antigen)	MAGEA3 MAGE3	Homo sapiens (Human)	314
511	Melanoma	Q13007	IL24_HUMAN	reviewed	Interleukin-24 (IL-24) (Melanoma differentiation-associated gene 7 protein) (MDA-7) (Suppression of	IL24 MDA7 ST16	Homo sapiens (Human)	206
512	Melanoma	Q16655	MAR1_HUMAN	reviewed	Melanoma antigen recognized by T-cells 1 (MART-1) (Antigen LB39-AA) (Antigen SK29-AA) (Protein Melan	MLANA MART1	Homo sapiens (Human)	118
513	Melanoma	P43355	MAGA1_HUMAN	reviewed	Melanoma-associated antigen 1 (Antigen MZ2-E) (Cancer/testis antigen 1.1) (CT1.1) (MAGE-1	MAGEA1 MAGE1 MAGE1A	Homo sapiens (Human)	309

Fig. 8: Results Obtained

CHAPTER-10: REFERENCES

1. Russell W. Jenkins, David E. Fisher, Treatment of Advanced Melanoma in 2020 and Beyond, Journal of Investigative Dermatology, Volume 141, Issue 1, 2021,

2. Cutaneous Squamous Cell Carcinoma: From Pathophysiology to Novel Therapeutic Approaches by Luca Fania 1,*,†,Dario Didona 2,†ORCID,Francesca Romana Di Pietro 1,Sofia Verkhovskaia 1,Roberto Morese 1,Giovanni Paolino 3,Michele Donati 4,5,Francesca Ricci 1,Valeria Coco 6,Francesco Ricci 1,Eleonora Candi 1,7,Damiano Abeni 1 and Elena Dellambra

3. McDaniel B, Badri T, Steele RB. Basal Cell Carcinoma. [Updated 2021 Sep 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan

4. Moreira, A., Heinzerling, L., Bhardwaj, N., & Friedlander, P. (2021). Current melanoma treatments: where do we stand?. Cancers, 13(2), 221.

5. Balasubramaniam, V. (2021). Artificial intelligence algorithm with SVM classification using dermascopic images for melanoma diagnosis. Journal of Artificial Intelligence and Capsule Networks, 3(1), 34-42.

6. Ling, Z., Cheng, B., & Tao, X. (2021). Epithelial-to-mesenchymal transition in oral squamous cell carcinoma: Challenges and opportunities. International journal of cancer, 148(7), 1548-1561.

7. Fania, L., Didona, D., Di Pietro, F. R., Verkhovskaia, S., Morese, R., Paolino, G., ... & Dellambra, E. (2021). Cutaneous squamous cell carcinoma: From pathophysiology to novel therapeutic approaches. Biomedicines, 9(2), 171.

8. Tampa, M., Georgescu, S. R., Mitran, M. I., Mitran, C. I., Matei, C., Caruntu, A., ... & Neagu, M. (2021). Current perspectives on the role of matrix metalloproteinases in the pathogenesis of basal cell carcinoma. Biomolecules, 11(6), 903.

9. Oh, C. C., Jin, A., & Koh, W. P. (2021). Trends of cutaneous basal cell carcinoma, squamous cell carcinoma, and melanoma among the Chinese, Malays, and Indians in Singapore from 1968-2016. JAAD international, 4, 39-45.